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A Critical Examination of Critical Realism

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DECLARATION

I declare that this thesis was composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgment, the work presented is entirely my own.

ABSTRACT

Methodological issues lie at the heart of the current science-theology exchange and it has been in particular the concept of *critical realism* that has been widely adopted as providing the rationale for an enriching dialogue between science and theology. Introduced by Ian G. Barbour and further developed by, among others, Arthur Peacocke and John Polkinghorne, critical realism has become the default position for many within the field of science and religion and it has made possible the developments of the past six decades in this field.

Despite its prominent position, an in-depth and critical examination of critical realism from philosophical perspectives is currently lacking in the science and theology literature. Aware of this need, the aim of this project is twofold. First, this research intends to define and clarify what is actually meant with critical realism. In doing so, I introduce the notion of 'family resemblance' as a helpful metaphor for understanding the many nuances of various critical realisms in science-theology scholarship. Furthermore, a taxonomy of the various philosophical and methodological commitments is offered, which forms the backbone of subsequent chapters (Chapter 2 on metaphysics, Chapter 3 on epistemology, Chapter 4 on semantics, and Chapters 5, 6, and 7 on methodology).

Second, this study aims to reveal certain weaknesses in the rationale underpinning and informing the critical realist stance. Hefner's critical diagnosis of critical realism runs as a leitmotif through this doctoral thesis:

> This now widely used term, 'critical realism', is beginning to appear in the writings of several authors in a somewhat doctrinaire sense, as if it were an established theory of explanation, when in fact it is a suggestive hypothesis that is struggling for credibility in the marketplace of ideas (Hefner, 1985: 32).

In addition to various chapter-specific challenges, we will turn to Hefner's diagnosis in particular in Chapter 8. Here I introduce Pelikan's distinction between 'apologetics' and 'presupposition' as a helpful way to understand the aims of critical realism and to show that critical realism is indeed a suggestive hypothesis. Furthermore, with the

chapter-specific weaknesses and two more general criticisms, I hope to argue that critical realism should be understood as mostly a suggestive hypothesis that has become critical for those who take a positive stance towards the epistemological capabilities of theology and a critical stance for those considering science as the only valid way of acquiring knowledge.

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INTRODUCTION

Slowly emerging in the mid-nineteenth century and becoming a dominant stance to take from the twentieth century onwards, science has proceeded as if the question of God should be understood as superfluous to the inquiries of science. Given the unprecedented success of natural science in explaining the natural world, the disappearance of religion from the public sphere has been widely understood in terms of a sign that God does not matter anymore. Popular thinkers, such as Richard Dawkins and Sam Harris, have paved the way for the disappearance of religion by providing an apprehension of nature that is purely grounded on science and, thus, devoid of any religious influences. Science is presented in such a way as to normatively support conclusions about life's existential questions, causing the oft-assumed descriptive/normative distinction to fade.

An apt example here is Harris' attempt to expand the boundaries of science in such a way as to include morality, where morality should be grounded on scientific principles and validated by recent scientific findings. As Harris puts it:

> I will argue, however, that questions about values – about meaning, morality, and life's larger purpose – are really questions about the well-being of conscious creatures. Values, therefore, translate into facts that can be scientifically understood: regarding positive and negative social emotions, retributive impulses, the effects of specific laws and social institutions on human relationships, the neurophysiology of happiness and suffering, etc. (Harris, 2010: 1-2)

What these science popularisers have in common is an unprecedented confidence in science and its competence to explain more-than-factual questions, such as where we came from and what we are here for. These rather radical statements have caught the popular imagination, relativising all non-scientific modes of knowledge to the terms and conditions of science. In Harris' case, the *what ought to be*-questions of morality are transformed into factual, and thus scientific statements. Theology and philosophy are, as a consequence, considered to be irrelevant for and lose their primacy on moral

matters. As a result, the widespread view that science has superseded alternative modes of thinking, such as theology, is reinforced.

Out of this rather isolated position, a systematic and academic discourse has emerged between science and theology that has found ways to move beyond the dichotomy between science and theology; a quest for a common ground that allows for an enriching dialogue between two disciplines that are often perceived as being in conflict. Developments in the sciences have been significant for this rapprochement between science and theology, according to those participating in science-theology scholarship. Big Bang cosmology, for example, has led to speculations about the relationship between an eternal Creator and the temporal origins of our universe, and the idea of a fine-tuned universe has sparked discussions regarding the divine origins of our universe.

In addition to these scientific developments, there is also a renewed openness and interest in engaging with science within the Church. An example here are the words of the then pope John Paul II to the then Director of the Vatican Observatory George V. Coyne:

> Theology has been defined as an effort of faith to achieve understanding, as *fides quarens intellectum*. As such, it must be in vital interchange today with science just as it always has been with philosophy and other forms of learning. Theology will have to call on the findings of science to one degree or another as it pursues its primary concern for the human person, the reaches of freedom, the possibility of Christian community, the nature of belief and the intelligibility of nature and history. The vitality and significance of theology for humanity will in a profound way be reflected in its ability to incorporate these findings (John Paul II, 1988: M10).

A theology, according to John Paul II, that discounts the findings of science is untenable. Challenges posed by science could spark theological reflection into new directions and purify the teachings of the Church from error and superstition.[1] However, with the renewed interest in the intricate relationship between science and theology, methodological questions emerged. How could such a theological

[1] See John Paul II, 1988: M13.

interpretation of scientific findings be carried out? Should we understand the influence of science on theology as direct and immediate, and vice versa? What role do metaphysical, epistemological, and semantic considerations have to play?

Central, then, to the emergence of this dialogue has been critical realism, which is often understood in terms of a philosophical framework that offers a set of arguments to bridge the apparent methodological and epistemological gaps between science and theology. Introduced by Ian G. Barbour and further developed by John Polkinghorne and Arthur Peacocke, critical realism has become a very significant position in explaining the relationship between science and theology and it has made possible the developments of the past six decades in this field.[2] Probably the most helpful definition of critical realism has been put forward by N.T. Wright, who defines critical realism in terms of

> a way of describing the process of 'knowing' that acknowledges the *reality of the thing known, as something other than the knower* (hence 'realism), while also fully acknowledging that the only access we have to this reality lies along the spiralling path of *appropriate dialogue or conversation between the knower and the thing known* (hence 'critical') (Wright, 1992: 35).[3]

We will unpack the philosophical commitments of critical realism in the following chapters, but let me provide a very brief sneak preview here. For critical realists, reality is not constructed in any way because it exists mind-independently. But all knowledge claims about that mind-independent reality are indirect and mediated through conceptual frameworks. There is no theory-free or theory-neutral observation, critical realism maintains. As a result, knowledge is always prone to error and our linguistic concepts only represent the objects to which they refer partially and inadequately.

These commitments, of course, have significant consequences for the critical realist account of science. In particular in more popular literature on the sciences, as discussed above, science is often portrayed in terms of its objective methods, logical procedures, and infallible knowledge; a position that is called 'naïve realism' by critical realists. Science and its methods have become the hallmark of knowledge and all

[2] See Russell, 2004: 45.
[3] Italics: Wright.

epistemological claims about reality should be measured accordingly. As a result, there is no room for theology in the era dominated by the sciences. For critical realists, the issue with these rather optimistic accounts of science is not of scientific knowledge as such, but rather the excluding character these accounts seem to assume. As Gilkey puts it, "the view of science that I criticize (1) sees science as the only way to know reality and so the only responsible means for defining reality for us and (2) views the results of science as providing an exhaustive account of reality or nature and hence leaving no room for other modes of knowing, such as aesthetic, intuitive, speculative, or religious modes" (Gilkey, 1993: 2). With the critical realist's framework in hand, critical realists, then, aim to move beyond the dichotomy between science and theology, and to offer an alternative position that allows for the enriching engagement between both phenomena.

Despite its central role and the shared confidence amongst many participants in the science-theology exchange in its capabilities and promises, others have become more critical about critical realism. The eminent Irish philosopher Ernan McMullin, for example, is critical about the striking similarities that critical realists seem to suggest between science and theology. He points out that "it would be unwise to push the parallel any further, or suggest that what enables the realism of science to be self-critical and progressive may somehow be transferred to the domain of religious belief" (McMullin, 1985: 47). Other commentators, such as Willem Drees, make similar arguments against critical realism.[4] This state of affairs has led Philip Hefner to make an apt diagnosis of the status of critical realism:

> This now widely used term, 'critical realism', is beginning to appear in the writings of several authors in a somewhat doctrinaire sense, as if it were an established theory of explanation, when in fact it is a suggestive hypothesis that is struggling for credibility in the marketplace of ideas (Hefner, 1985: 32).

It is Hefner's apt analysis that sparked this study into existence for several reasons. Let us turn to these reasons in the following sections.

[4] See Drees, 1996: 139-144.

The Current State of Affairs: Critical Realism, its Commentators, and the Need for Elaboration

My research began as an attempt to determine how important critical realism actually is for the science-theology exchange. The term 'orthodox' is sometimes used here to describe the position of critical realism in science-theology scholarship, demonstrating the wide acceptance critical realism has amongst the participants in the exchange.[5] As Russell puts it, "most scholars in the field have adopted and developed the term [i.e. critical realism], although some, while sharing one or more of its arguments, have moved away from the term" (Russell, 2004: 45). We can also read a similar sentiment in Hefner's diagnosis of critical realism, where he points out that critical realism is widely used.

However, despite the fact that critical realism is very significant for science-theology scholarship, Hefner continues his analysis by claiming that critical realism is used as if it is already an established philosophy, whilst it is actually still a suggestive hypothesis. As far as I can see, Hefner seems to be right. Whilst researching the various philosophical tenets of critical realism, it turned out that most of the references to critical realism are made in passing and prior knowledge is often assumed. As a result, a clear and precise articulation of the commitments of critical realism seems to be absent in science-theology scholarship, which offers an opportunity to provide a – hopefully – more precise and comprehensive account of critical realism. What is actually meant by 'critical realism'? Who are these critical realists and how do they relate to each other? What are their stances regarding metaphysics, epistemology, and semantics? What are the opposing schools of thought? Are there any particular areas of weakness in the account of critical realism? Are there any alternative positions that may well offer a more elaborative account of the science-theology exchange? These often unanswered questions provide an opportunity to suggest a more nuanced and comprehensive account of critical realism that – as far as I can see – is currently lacking in science-theology scholarship.

The first step I have taken in this direction is to introduce the notion of 'family resemblance' to understand the various philosophical positions within critical realism. Whilst critical realism is sometimes assumed to be a unified account, where each critical realist endorses a similar set of commitments, the opposite seems to be true.

[5] See Hefner, 1985: 32; Gregersen, 2004: 77.

Whilst there are indeed striking similarities between critical realists, we should not ignore some pivotal differences. We find these differences in – amongst other areas – their theological agenda and their views on semantics. Peacocke, for example, defends panentheism as the most appropriate theological view, whilst Polkinghorne seems to take a more traditional Christian approach. But also, in more recent accounts of critical realism, we see significant differences. Whilst Barbour, Peacocke, Polkinghorne, and Soskice consider recent developments in philosophy of science as very valuable for theology and suggest a direct transferring of philosophy of science to theology, more recent accounts of critical realism, most notably those of Kees van Kooten Niekerk, Paul Allen, and Andreas Losch, reject such a methodological stance. We should therefore have a concept in place that allows us to recognise both the similarities and the differences of critical realism, and – as I will argue in Chapter 1 'The Evolution of Critical Realism' – the notion of family resemblance might offer just that.[6]

A second step has been to position critical realism in the appropriate fields of philosophy and to engage the critical realist account with relevant developments and literature within the area of philosophy. As this research will suggest, parallels and strong similarities will appear between particular philosophical traditions, such as some possible links with Kantian philosophy and the resulting endorsement of fallibilism in epistemology. Sometimes other commentators have made similar suggestions, but, then, their argument seems to lack in-depth engagement due to their confinement to a few pages in an article or book chapter. By engaging critical realism with these developments more comprehensively, a clearer understanding of the philosophical tenets of critical realism will emerge. Furthermore, we have also studied some criticisms of the commentators of critical realism, most notably Michael Durrant, that have been thus far neglected by critical realists. Durrant offers some very substantial criticisms to the account of critical realism, in particular on their epistemological and semantic commitments. We will explore these criticisms in the relevant chapters.

Another step has been to reveal the – what I would call – underlying mechanisms of critical realism. In general, critical realism seems to make two gestures. First, we should recognise the human elements that underpin scientific practice. Science is not a fully objective discipline that leads to infallible knowledge, such as the naïve realists

[6] See p. 24ff.

would maintain. On the contrary, scientists are actively involved in their scientific research and the scientific community has a key role to play here. As such, we should recognise the psychological, sociological, and historical factors that influence scientific practice. Second, however, theology is redefined in such a way as to meet the standards of science. Rather than appealing to ecclesiastical authority, theologians should use the principles of science for their theological reflection. Data in this context are religious experiences and narratives, and critical realists suggest various tools to evaluate theological data in a similar manner as scientists would evaluate their data. Therefore, this study does not only offer a positioning of critical realism in relevant philosophical debates, but it also provides a dissection of the underlying motives that might have informed certain philosophical decisions in the critical realist literature. Hopefully, this will lead to a more nuanced, multifaceted, and comprehensive account of critical realism.

Methodology, Definitions, and Structure of the Thesis

How do we reach such an ambitious goal of providing a more comprehensive account of critical realism? Before delving into the outline of this research, a number of reflections and comments with regard to methodology are in place. The method that structures this research could be characterised as analytic, contextual, and reflective. It is analytic, because this research sets out to examine and suggest definitions of the various tenets of critical realism. This study explores various branches of critical realism, suggests a taxonomy of naïve and critical realism, and situates critical realism in appropriate philosophical fields. As alluded to in the above sections, many comments with regard to critical realism are made in passing and the exposition of its arguments are often confined to one or two chapters and a handful of articles. As a result, many of the critical realist beliefs and commitments are read between the lines, instead of being explicitly and carefully stated. This state of affairs, however, significantly jeopardises the development of critical realism, because a clear and explicit understanding of its tenets is pivotal for a critical reflection and enriching dialogue. By offering a more careful and comprehensive analysis, this study aims to take away the fog around critical realism, and to pave the way for future dialogue regarding the usefulness of critical realism to the science-theology exchange.

Furthermore, and consequent upon the first, my research intends to be sensitive to the various philosophical contexts in which critical realism participates, remedying the

decontextualised state of affairs in which critical realism often seems to find itself. Whilst participating in debates concerning, *inter alia*, metaphysics, epistemology and semantics, critical realists often seem to be unaware of the contemporary debates in philosophy. For example, scientific realism is often portrayed as a unified school of thought amongst critical realists, as if each scientific realist subscribes to a fixed set of beliefs and commitments. However, numerous philosophical subtleties are overlooked amongst scientific realism, where some scientific realists, for instance, emphasise a particular metaphysical commitment by critical realists, whilst others reject such a stance – all under the banner of scientific realism. Even though a comprehensive account of each context would require multiple volumes of its own, I aim to advance critical realism by situating their tenets in the relevant fields of philosophy, ranging from metaphysics to epistemology, from philosophy of science to philosophy of religion. By doing so, I hope to offer a more advanced understanding of critical realism and find new ways to shed light on its core principles.

Whilst major parts of the thesis are more expository in style, finally, and consequent upon the second, this present study goes beyond the descriptive mode, as it intends to reflect on the viability of critical realism. My research aims to suggest a framework for understanding the relationship of the various critical realists by using the notion of 'family resemblance', and I will also point out a number of weaknesses in the critical realist's rationale. First and foremost, I will question the validity of the direct transferring of philosophy of science to theological practice, which – as far as I can see – jeopardises theology. But there are also more apologetic motives at play here, where critical realism offers a rationale for defining the Christian faith. Using a more reflective approach that is grounded on the analytical approach and sensitive to the context in which critical realism emerged, my research intends to advance the science and theology field by offering a comprehensive exploration into one of its main components; a position critical realism has been granted from the beginning onwards.

While the methodological issues help us in setting out to provide a more comprehensive and nuanced account of critical realism, there remains the question of how to define a number of key concepts that allow us to navigate the philosophical complexity that we engaged with in this study. First, we have used the word 'dichotomy' in the title of this present study and suggested that critical realism wants to move 'beyond the dichotomy'. But what do we actually mean here? If we

understand 'dichotomy' in terms of a contrast or a division between two things that are considered as being opposed to one another, then I use the phrase here as a characterisation for the endeavours of those endorsing critical realism. Barbour, Peacocke, Polkinghorne and others clearly set out to find a meaningful dialogue between science and theology in order to move beyond the oft-assumed dichotomy between both disciplines. With the unprecedented results of science, there has been a significant existential pressure put on theology as an academic discipline and – for many – theology seems to struggle for credibility. This existential pressure on theology has caught the popular imagination through the work of the New Atheists, such as Richard Dawkins, Sam Harris, and Christopher Hitchens. I believe that critical realism has been fundamental to the attempts of Barbour and the like to restore the academic credentials of theology, and, as such, critical realism has allowed them to move beyond the dichotomy between science and theology.

But, second, to which science are we referring to? Do we have all the sciences in mind, ranging from mathematics to archaeology, and from psychology to quantum physics? We will take a rather narrow view of science here. Wherever we talk about 'science', we have the natural sciences in mind, most notably physics and biology. If there are any exceptions, we will make this explicit. This seems to be a common practice in science-theology scholarship in general, but also most critical realists take such an approach. In this study, we simply follow suit.

Third, a more important distinction that has to be made is between religion and theology. Even within the science-theology field, discussions have taken place regarding whether or not we should talk about 'religion'. In his contribution to *The Oxford Handbook of Religion and Science*, Michael Welker, for example, argues that we should not talk about religion, but rather about theology. His main argument for this stance is that "in order to enter into a meaningful dialogue with 'science', it is necessary to bring 'religion' on to an academic, or at least intellectual, level (theology, religious studies, philosophy of religion, etc.)" (Welker, 2006: 552). For Welker, the science-theology dialogue is mainly a discourse between two areas of knowledge. However, Philip Hefner, also contributing to *The Oxford Handbook of Religion and Science*, prefers the term 'religion' over and against 'theology'. According to Hefner, we should use the term 'religion', because – among other reasons – religion is a familiar notion amongst the general public, whereas 'theology' might stand for a more

esoteric or sectarian approach. Both reasons seem to be fair, but which term should we use in our discussion of critical realism?

For making such a decision, we should have a definition in place that allows us to distinguish religious realism from theological realism. For this, we need to turn to Andrew Moore's contribution to the *Routledge Encyclopaedia of Philosophy*. According to Moore, we could apply realism to both theology and religion, but we should make a distinction between these two kinds of realism. But how do they differ? For Moore, "*theological* realism can be distinguished from *religious* realism in that debate about the former arises from and draws upon the beliefs and doctrines of a particular religious tradition such as Christianity" (Moore, 2015). Here religious realism has a more abstract nature in that it does not have its sources in one particular religious tradition, whereas theological realism starts from within the Christian faith.

How should we apply this to critical realism? First, we should recognise that not all critical realists explicitly refer to theology as their area of focus, but rather claim to find a relationship between science and religion. We find such a focus on religion in particular in the work of Barbour, who makes the suggestion that he is concerned with religion in general. But, if we use Moore's definition here, then we should understand the work of Barbour rather in terms of being a *theological* realist position. Barbour clearly draws upon sources that originate in the Christian tradition and, furthermore, he engages in various science-theology debates taking a clear Christian position. In his *Issues in Science and Religion*, for example, Barbour discusses the relationship between evolutionary theory and creation, where he addresses only key Christian positions. Barbour also seems to be aware of his preference for Christianity, because he claims that he uses the term religion to refer to the 'Biblical religion', which "has shaped the common assumptions of Judaism, Roman Catholicism, and Protestantism – such as the doctrine of creation or the idea of an active and purposeful God" (Barbour, 1966b: 9). Furthermore, recalling Welker's preference for using the term 'theology' over and against 'religion', Barbour – but also the other critical realists – has a clear preference for the cognitive side of religion, because it allows Barbour to find similarities between science and theology. We could apply a similar rationale to Polkinghorne. Peacocke, on the other hand, explicitly takes a *theological* realist position. He claims that he has been developing a "critical theological realism" that "places at the center past and present religious experience, the continuous community, and an interpretative tradition" (Peacocke, 1984: 47). Also, Soskice is explicit in

endorsing a theological critical realism. According to Soskice, such a theological position claims that

> the theist can reasonably take his talk about God, bound as it is within a wheel of images, as being reality depicting, while at the same time acknowledging its inadequacy as description. This, we believe, is the position a critical theological realist must take (Soskice, 1985: 141).

Furthermore, we also find a similar categorisation of critical realists as *theological* realists in the work of others. Moore, for example, provides several examples of critical realists that suggest a theological realism, most notably Janet Martin Soskice, but also Barbour, Peacocke, Polkinghorne, and van Huyssteen.[7] Therefore, this thesis is not so much concerned with religion in general, but, rather, it discusses the relationship between the (natural) sciences and Christian theology.

Fourth, we will discuss critical realism. But what is critical realism? As I will suggest in Chapter 1 'The Evolution of Critical Realism', I view critical realism as resembling a family, where I recognise both the strong similarities and the subtle differences.[8] There is no *the* critical realism. Instead, critical realism seems to be a malleable concept that has been suggested by a number of people within and also outside science-theology scholarship, e.g. Soskice and Gilkey. What, then, binds this family together? Belonging to this critical realist family means the endorsement of three core principles, which could be stated – very briefly – as follows:

1. Metaphysical stance: reality exists mind-independently, but all knowledge claims about that reality are considered to be scheme-dependent.
2. Epistemological stance: critical realism endorses epistemological fallibilism as the most appropriate stance in epistemology.
3. Semantic stance: the critical realist semantic stance gravitates around the principle to take our theories and models 'seriously, but not literally'.

[7] See Moore, 2015.
[8] See p. 24ff.

But some, most notably Barbour, Peacocke, Polkinghorne, and Soskice, also endorse a fourth key principle that seems to set them somewhat apart from the other critical realists:

4. Methodological stance: critical realism is first and foremost a philosophy of science, but we should directly transfer it to the context of theology.

We will unpack the notion of family resemblance and each of these key principles in the following chapters. But, for now, if we refer to critical realism in this study, then we have this idea of critical realism as resembling a family in mind, where we recognise both similarities and differences amongst critical realists.

With the methodological issues complete and definitions of a number of key concepts given, we can now turn to the structure of this thesis. It is divided into eight chapters, with Chapter 1 offering the backbone of this study by introducing the notion of 'family resemblance' and suggesting a taxonomy of critical realism. Chapters 2 to 4 aim to unpack and articulate various philosophical tenets of our taxonomy of critical realism. Chapter 5 and 6 are concerned with the stance of critical realism towards philosophy of science, whilst Chapter 7 deals with their views regarding theology. Chapter 8, then, offers a critical reflection about the beliefs and commitments of critical realism. Let me unpack each of these chapters in more detail.

Chapter 1 charts the evolution of critical realism in the current science and theology field. Beginning with an overview of various attempts to elucidate the historical origins of critical realism, we will introduce the notion of 'family resemblance' to help us understand the various positions critical realists seem to take. Despite some very strong parallels between these various accounts, there are subtle differences that should be accounted for. With the notion of 'family resemblance' in hand, we set out to explore these similarities and differences, starting with the work of Barbour, Peacocke, and Polkinghorne. After our discussion of these three 'founding fathers', we widen our family circle and turn to more recent work on critical realism, most notably Kees van Kooten Niekerk, Paul Allen, and Andreas Losch, and we try to find a place for them within the critical realism family. But there is also an 'outer circle', consisting of those who endorse a form of critical realism but are not really engaging in science-theology scholarship. Examples here are Soskice and Langdon Gilkey. We will try to position

Soskice and Gilkey within the framework of 'family resemblance'. After the 'who-is-who'-part of this chapter, we will provide a taxonomy of critical realism, where we introduce the aforementioned four principles of critical realism: metaphysics, epistemology, semantics, and methodology. In the following chapters, then, we set out to unpack each of these principles.

Chapter 2 examines the metaphysical stance of critical realism. In its metaphysical endeavours, critical realism strongly opposes two schools of thought: naïve realism, according to which there is an immediate and direct relationship between objects known and the knower, and idealism, which gravitates around the mind-dependence of all objects. Critical realism sets out to find a middle ground that recognises the pivotal role conceptual frameworks have in the acquisition of knowledge, whilst maintaining that all of reality exists mind-independently. In grounding their arguments, critical realists seem to take an approach that may well bear a close resemblance to Kant's critical philosophy. Central to Kant's philosophy is the structuring ability of the human mind that makes experiences of nature possible for us. Objects are not passively given to us; the knower is actively involved in structuring its experiences. As a result, objects-in-themselves remain unknown, because all we have access to are the objects as they appear to us. As I will point out in this chapter, similar sentiments and arguments can be found in the critical realist's rationale, but there are also significant differences between Kant and critical realism.

Chapter 3 aims to provide a careful analysis of the epistemological considerations of critical realism. Central to their rejection of naïve realism is the notion of fallibilism. Whilst naïve realists have an unprecedented confidence in the capabilities of science, critical realism points out the proneness to error of all knowledge. Infallible knowledge and absolute certainty are unreachable, critical realists maintain. Hence, critical realism takes a rather sceptical turn with regard to the epistemological capabilities of science. But, in order to ward off sheer scepticism, according to which we could have little to no knowledge at all, critical realists still have a confidence in the possibility of acquiring knowledge, yet conclusive justification is lacking and thus all knowledge is provisional. To secure this confidence, critical realists introduce the notion of 'critical reflection', which I rephrase as the criterion of 'withstanding serious criticism'. But there are important challenges that could be raised against the critical realist's endorsement of epistemological fallibilism, and we will spend the final sections of this chapter trying to suggest a way forward for critical realism.

Chapter 4, then, turns to the semantic commitments of critical realism. Whilst those who adhere to naïve realism endorse a literalist stance, according to which our linguistic constructs exhaustively and exactly represent reality, critical realism takes a more sceptical stance and points out that we should take theories and models 'seriously but not literally'.[9] For critical realists, language originates in the human mind, but our language does refer and represent – albeit inadequately – parts of reality. The semantic stance, then, of critical realism gravitates around four key concepts: analogies, models, metaphors, and theories. Whilst models and theories are the result of the sciences and theology, analogies and metaphors put the linguistic constructs in the context of fallibilism: our constructs do not exhaustively represent reality, because there is always the possibility of being mistaken. Important, however, for critical realists is to explain how our fallible linguistic concepts are nonetheless referring. We will turn to this issue by studying Soskice's turn to causal theories of reference as a way forward here, but we will also look at Michael Durrant's critique of Soskice.

With the narrative of the first three principles of our taxonomy of critical realism now complete, we will turn to laying the foundation of the fourth, methodological principle. Chapters 5 and 6 show how these philosophical considerations inform the critical realist's views of science. In Chapter 5, the first set of arguments will be explored against naïve realism. Pivotal for the rationale of critical realism is the notion of the scientist as a passionate, experiencing, and interpreting human being. Whereas logical empiricism, for example, considers science in terms of a logical and mechanical procedure, critical realists point out that such an understanding offers a distorted account of science, and they appeal to two key thinkers to warrant their claim. First, Norwood Hanson's notion of 'theory-ladenness' receives a warm reception amongst critical realists. For critical realists, there is no theory-free or theory-neutral knowing; all knowledge is theory-laden, due to the conceptual framework involved. Second, Michael Polanyi offers sustained arguments to warrant the idea of the scientist as passionate and contributing to scientific research, and his criticism of the damaging split between the object and subject, as suggested by the critical realists' interpretation of naïve realism, has allowed for the rehabilitation of the role of belief and commitment in all rational activity. For critical realists, then, it is particularly the

[9] See Barbour, 1974: 38; Peters and Peterson, 2013: 187.

recognition of the rooting of all knowledge in interpreted experience that is considered to be fundamental to their attack against naïve realism.

However, it is not only the argument of the scientist as an experiencing and interpreting human being that has been put forward by critical realists against those who are too optimistic about the capabilities of the sciences. Whereas Chapter 5 discusses the scientist on an individual level as a passionate and experiencing being, Chapter 6 considers the sociological and communal factors informing scientific practices. Science takes place within the wider community of scientists, which influences the scientists in doing research, along with historical and other sociological factors. Important here is the historical turn in philosophy of science, most notably the work of Thomas Kuhn and Imre Lakatos, who emphasised the importance of historical studies of science in assuring that philosophy of science has an actual subject matter. For critical realists, then, science should be understood in terms of a shared activity of a social group, which is grounded on shared commitment and beliefs, and it is the outlook of such a group that informs the scientist.

Chapter 7 turns to the scientisation of theology, where critical realism in philosophy of science is understood in terms of a constructive application for theology. It is not only the scientist who is influenced by psychological and sociological factors: a similar characterisation holds true for theologians as well. However, whilst recognising the human elements that underpin theological practice, critical realists set out in an opposite direction compared to their strategy for discussing science. In the case of the sciences, the emphasis was put on the human elements underpinning science, whereas the theological explorations of critical realism are more concerned with giving theology a more objective, or scientific, outlook. In addition to those who consider science in terms of its objectivity and deem theology as meaningless, critical realists are also critical about the more traditional, or ecclesiastical approaches often found in theology. Theology should not be understood in terms of a top-down approach, where decisions about the validity of certain beliefs and doctrines are made hierarchically, but a bottom-up approach is suggested by critical realists that allows for the rehabilitation of theological practice. Rather than formulating beliefs on the basis of revelation, theologians should be concerned with 'empirical data', i.e. religious experiences and narratives, and apply criteria of reasonableness, which critical realists borrow from the sciences, to determine the validity of theological assertions. All this, then, allows critical realists to reinstate the credibility of theology. However, theology

seems to pay a rather high price for the empirical turn of critical realism and there are good reasons for being critical about such a bottom-up approach. For example, such a bottom-up approach seems to imply that knowledge of God does not stem from God, but we only know God using material that is available to us. Yet, this is problematic, as it leads to sheer anthropomorphism, and critical realists do not seem to be eager to be accused of such a stance. It will, therefore, be suggested that critical realists should take a more moderate stance, and allow for a *via media*, where there is room for the revelation of eternal truths as well as being sensitive towards the temporal situation in which the eternal truth is received.

Chapter 8 completes the work as we will zoom out a bit in order to provide a more general reflection on critical realism. First, we will try to understand the underlying mechanisms of critical realism by using a framework suggested by Jaroslav Pelikan, who divided his research into the Cappadocian Fathers along the lines of 'apologetics' and 'presupposition'. We could use similar terms to understand the aims of critical realism: defend the Christian faith (hence: apologetics) but also to suggest a new narrative for theology (hence: presupposition). But, there are also some issues with the narrative suggested by critical realism. Whilst critical realism, for example, is sometimes presented as a well-crafted philosophy, I will cast doubt on such a view of critical realism. As Hefner already pointed out, critical realism is a suggestive position that still struggles for credibility. Furthermore, there are also problems with the accounts of critical realism regarding science, theology, and their relationship. We will explore each of these criticisms in more detail in Chapter 8, and we will also suggest some first steps for future directions for the science-theology community to either improve critical realism or to find a new paradigm that allows for the enriching engagement between science and theology.

All this, then, contributes to the primary argument of this thesis that critical realism should be understood in terms of a suggestive position, which is sympathetic towards the (natural) sciences whilst being embedded in a strong theological worldview. The hope, then, of this work is that it contributes to a better understanding of the complexities involved in the relationship between science and theology. First and foremost, I hope to raise awareness about the complexities of the numerous philosophical assumptions underpinning the science-theology exchange and the need to articulate these assumptions carefully in order to advance the dialogue. Second, this research aims to rethink the isolated place theology often finds itself in, and to invite

theologians to join and contribute to the conversation in order to broaden the scope of the field of science and theology. Whilst some might have found a safe haven at theological seminaries as a response to the increased pressure upon theology, theology needs to find ways of engaging with the sciences if it is not to shut its doors to all other forms of truth-seeking, and critical realists have taken commendable steps to move forward here. As discussed above, the need for a careful articulation of critical realism is therefore pressing, and it is my hope that further research will be done in finding new paradigms that allow for a better understanding of the relationship between science and theology.

Let us begin by taking the first steps in the direction of articulating the beliefs and commitments of critical realism.

CHAPTER 1

THE EVOLUTION OF CRITICAL REALISM

Mapping the Debate

Before discussing the various philosophical considerations suggested by critical realists in science-theology scholarship, a mapping of the critical realist debate in general is required. In this chapter, the evolution of critical realism within the science and theology literature will be discussed. Before doing so, we first need to shed some light on the historical roots of critical realism in the science and theology dialogue (Section 1.1). As it turns out, it can be challenging to actually reveal the historical origins of critical realism. This historical exercise will be followed by the introduction of the notion of 'critical realism as family resemblance' for understanding critical realism (Section 1.2). Even within science and theology scholarship, there are various critical realisms that seem to resemble each other closely, but with key differences. Whilst recognising the differences amongst critical realists, it is helpful to provide a taxonomy of critical realism that we will use as a foregrounding mechanism for our explorations into the more specific philosophical stances of critical realism in later chapters (Section 1.3).

1.1 The Historical Origins of Critical Realism in Science-Theology Scholarship

Critical realism has been intrinsic and critical to the emergence and development of the science and theology field. Ever since Ian Barbour coined the term 'critical realism' in the science and theology dialogue in his *Zygon* article 'Commentary on Theological Resources from the Physical Sciences' in 1966 and developed it further as a series of arguments in *Issues in Science and Religion*, critical realism has received a warm reception and "has continued to be defended, deployed and diversified widely in theology and science" (Russell, 2004: 54).[1] Critical realism is considered by many to be the default position in the field of science and theology, most notably in the work

[1] In addition to the warm reception of critical realism within the science and theology debate, this particular concept has also been highly influential as a methodology for economics, politics, psychology and the like. Critical realism has, thus, been a particularly malleable concept that expands into a great variety of modes of thought and disciplines. See Bhaskar, 2008.

of the 'founding fathers' Barbour[2], Arthur Peacocke[3], and John Polkinghorne[4], but also more recently in Alister McGrath[5], Paul Allen[6] and Andreas Losch.[7]

As a result of the predominant position critical realism has in the science-theology exchange, a debate has emerged concerning the historical origins of this particular set of arguments that constitute critical realism. But what were the significant sources for Barbour in formulating his views on critical realism? Three attempts have been made thus far to unravel the historical rooting of critical realism in science-theology scholarship.[8]

The first to examine some of the historical sources of Barbour's understanding of critical realism was Kees van Kooten Niekerk. In his contribution to *Rethinking Theology and Science*, van Kooten Niekerk points out right from the outset that critical realism "has been used in connection with different philosophical positions" (van Kooten Niekerk, 1998: 52). According to van Kooten Niekerk, there is a direct relationship between Barbour's approach and early twentieth century neo-Kantian German and Sellars-like Anglo-American critical realism.[9] What critical realism in the science-theology exchange share with these other forms of critical realism is the rejection of what are often referred to as idealism and naïve realism. As will be explored in the proceeding chapters, a set of arguments has been put forward that recognises the mind-independent existence of reality (against idealism), whilst maintaining that all knowledge is mediated through prior conceptual frameworks (against naïve realism). However, van Kooten Niekerk does not offer a comprehensive analysis of the possible relationships of influence between Barbour and the German or

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[2] See e.g., Barbour, 1966b; *idem*, 1974; *idem*, 1997.
[3] See e.g., Peacocke, 1984; *idem*, 1993.
[4] See e.g., Polkinghorne, 1986; *idem*, 1991; *idem*, 1996; *idem*, 1998.
[5] See e.g., McGrath, 2002.
[6] See e.g., Allen, 2006.
[7] See e.g., Losch, 2011; For Losch's work in English, see Losch, 2005; *idem*, 2009; *idem*, 2010.
[8] It is important here to recognise the fact that each of these endeavours is limited to a paragraph or two, with the exception of Losch. Losch has dedicated an article discussing the historical origins of critical realism, but even in this rather long article, discussing the historical rooting of critical realism in Barbour's thinking is limited to one or two pages. See Losch, 2009.
[9] See van Kooten Niekerk, 2003: 191. Van Kooten Niekerk defines both traditions as follows: "In German philosophy, it [i.e. neo-Kantian critical realism] designates those positions which take account of Kant's critical epistemology but deny that the subjectivity of our experience makes it impossible to acquire valid knowledge of the external world as it is in itself. In Anglo-American philosophy, Critical Realism from 1920 onwards became the name of a movement that purported to integrate insights of both idealism and the so-called New Realism, which was a naïve realist to idealism." (van Kooten Niekerk, 1998: 52).

Anglo-American views of critical realism, and, as a result, his diagnosis of the apparent influence remains rather opaque and leaves the reader rather unsatisfied.

After van Kooten Niekerk's endeavour to indicate possible sources, Niels Henrik Gregersen and Andreas Losch have both attempted to provide a more comprehensive account of the historical roots of critical realism in the science-theology exchange. According to Gregersen, Barbour followed "a trend of the 1960s in which the idea of scientific realism was revived" (Gregersen, 2004: 85). Before the 1960s, logical empiricism flourished as the predominant school of thought in the 1920s and 1930s in Europe and the 1940s and 1950s in the United States. This tradition was primarily concerned with the logical analysis of scientific knowledge and it is particularly known for its verifiability principle of meaning, according to which all metaphysical statements are meaningless because we cannot verify the soundness of these statements. By the mid-1950s, it was becoming clear that the rationality of science could not solely depend on these rules of formal inference and inductive logic. Philosophers of science, therefore, turned their attention instead to "the processes of historical change out of which the basic concepts, theories, and methods of science have emerged, and to which they are continually subject" (Toulmin, 1977: 148). These historical records of scientific change, as well as arguments from psychology and sociology, became a powerful philosophical tool in the hands of philosophers like Norwood Hanson, who suggested in the mid-1950s that the aim of the observer is to get his observation to cohere against his background of prior knowledge.[10] Gregersen proposes that against this historical backdrop, philosophers like J.J.C. Smart and Norman Campbell, who were both arguing for the realist stance in the 1920s, influenced Barbour.[11] Gregersen concludes his more compendious discussion of Barbour's sources by proposing that "Barbour's early embrace of [critical realism], however, was informed partly by the realist movement of the 1920s (which includes Whitehead), partly by the movement of [scientific realism] which was still in its infancy in the 1960s" (Gregersen, 2004: 85).

The most comprehensive elucidation of the historical origins of Barbour's interpretation of critical realism has been the examination of Andreas Losch. From the outset, Losch disagrees with van Kooten Niekerk's reference to Sellars as a source of

[10] For a more comprehensive account of Hanson's philosophy, see Chapter 5 'The Humanisation of Science: The Scientist as Experiencing Being', see p. 144-147.
[11] See Gregersen, 2004: 85.

influence on Barbour's understanding of critical realism. According to Losch, throughout Barbour's *Issues in Science and Religion* no textual evidence can be found that would trace the roots of Barbour's understanding back to Sellars' interpretation of critical realism. As Losch puts it,

> there will be similarities to be found – nevertheless, it is not so difficult to 'reinvent' critical realism by adding a 'critical' to qualify one's own understanding of realism. So maybe this is just what Ian G. Barbour did (Losch, 2009: 98).

Nevertheless, Losch does point to several philosophers who might have influenced Barbour. Barbour's thinking was strongly influenced by the work of the eminent British mathematician and philosopher Alfred Whitehead, claims Losch, or to be more precise, by Mary Hesse's reading of Whitehead. Losch actually brings to light that Barbour misattributed the only quotation to Whitehead, which Barbour used to illustrate Whitehead's understanding of the relationship between perception and objects that exist mind-independently.[12] It appears in the work of Hesse, instead of Whitehead.[13] However, not only does Barbour make this misattribution, but also Hesse, which at least indicates Barbour's dependency on Hesse's account of Whitehead. In fact, the quote appears in the third chapter of Dorothy Emmet's *The Nature of Metaphysical Thinking*, in which she discusses the character of perceptual experience by looking at both Whitehead and Heidegger.[14]

But if Whitehead has influenced Barbour, and Barbour's account of critical realism depends on Hesse's interpretation of Whitehead, then this complicates the question of whether or not Whitehead has actually influenced Barbour. Losch, therefore, concludes that "the indirectness of the use of Whitehead does not mean that Barbour is not rooted in some philosophical tradition" (Losch, 2009: 90). Several sources must have influenced Barbour's understanding of critical realism, most notably Whitehead, and these sources pointed him in this direction. Accepting Gregersen's suggestion that Barbour has been influenced by the realist tradition of the 1920s and 1960s, Losch also

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[12] See Losch, 2009: 90. The specific quote is: "Whitehead speaks of 'a consciousness of ourselves as arising out of rapport, interconnection and participation in processes reaching beyond ourselves'" (Barbour, 1966b: 171). Barbour refers to Whitehead's *Symbolism* as the source for this quotation.
[13] See Hesse, 1955: 149.
[14] See Emmet, 1945: 63.

sees this period of time as particularly significant for Barbour's shaping of critical realism.

1.1.1 Critical About the Attempts to Unravel the Historical Origins of Critical Realism

The preceding section gives an overview of the different examinations of the influence of various philosophers and philosophical traditions on Barbour's understanding of critical realism. All these authors agree that Barbour might have been original in introducing critical realism in the science and theology dialogue, but he was clearly entrenched in the emergence of the new realist tradition of the 1920s and 1960s. However, there are a number of shortcomings to these previous accounts, which makes a helpful reconstruction of the historical origins almost impossible. In the following paragraphs, we will explore a number of these shortcomings.

First and foremost, criteria for determining whether a particular philosopher has exerted influence on Barbour's thinking are lacking. As a result, the lack of such criteria makes it difficult, if not impossible, to retrace the steps these accounts have taken in revealing the historical rooting of critical realism. As far as I can see, only Losch has alluded to such criteria, asserting that "evidence of these influences is given by the annotations in the relevant chapters of *Issues*" (Losch, 2009: 90). But, there seems to be an inconsistency in Losch's account regarding the alleged influence of Whitehead on Barbour and the tracing of sources by annotations. As mentioned above, Barbour seems to have read Whitehead secondarily through Hesse, because Barbour did not notice Hesse's mistake in referring to the right page number but in the wrong book. The question then arises whether or not it is appropriate to claim – as Losch does – that Whitehead exerted direct influence on Barbour, because the annotation is mistaken. If it is the case that Whitehead influenced Barbour, then Losch cannot explicitly hold his argument about annotations as the criterion of influence. But if Losch does hold such a criterion, then Whitehead may not have influenced Barbour directly, but we should understand the exerted influence in terms of a particular reading of Whitehead that has influenced Barbour, i.e. Hesse's reading. Thus, there seems to be an inconsistency here in Losch account: either hold such a criterion of reference and deny the influence of Whitehead, or reject such a criterion and argue for Whitehead as the dominant source of influence on Barbour.

In addition to the lack of criteria for determining the influence of *x* on Barbour, second, each of these accounts seems to assume that the exertion of influence only

takes place in a positive manner, where Barbour endorses a certain source as helpful for elaborating upon the critical realist stance. Hanson, Kuhn, and Polanyi are good examples of such a positive influence on Barbour.[15] Yet, influence can also be exerted in the opposite way, according to which Barbour wants to position himself *against* a certain tradition in philosophy; a possibility overlooked by these previous attempts. Such an opposing school of thought may well inform the critical realist stance in, for example, demarcating the epistemological boundaries in which critical realism wants to position itself. An overly positivistic stance towards the sciences, for instance, is no option for critical realism, because such a stance rules out the possibility of theological claims having any meaning. As I will discuss in the following chapters, pivotal for the emergence and development of critical realism has been its stance against so-called naïve realism.

Third, in addition to differences of influence in kind, i.e. acceptance and opposition, there is also a difference in degree.[16] For example, Barbour refers to Norman Campbell on several occasions in *Issues in Science and Religion*, [17] and, thus, according to Gregersen, Barbour has been influenced by Campbell.[18] However, Campbell is for the most part used to illustrate a particular argument.[19] Hanson and Polanyi, on the other hand, seem to have influenced Barbour in a much more fundamental yet intangible way, as will be discussed in later chapters. If we, therefore, compare the degree of influence exerted by, say, Campbell, Hanson, and Polanyi, we need to conclude – at the least – that there is a difference of degree, because Campbell could be reduced to a mere illustrative role, whereas the influence of Hanson and Polanyi seems to be more significant.

However, the difference in degree-argument reveals a more fundamental problem for those engaged with the historical origins of critical realism. How could such a difference actually be measured? It is impossible to definitively measure the influence that each particular source exerted on Barbour. Also, there are a number of sources where it is actually unclear to what extent they have influenced Barbour at all. A

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[15] Each of these philosophers will be discussed in Chapters 5 and 6 on 'The Humanisation of Science'.
[16] Not to mention that critical realists might also have been unaware of the implicit influence of a particular philosopher.
[17] See e.g. Barbour, 1966b: 144, 160, 170.
[18] See Gregersen, 2004: 85.
[19] For instance, Barbour refers to Campbell's *What is Science?* as an illustration of his realist claim that "*intelligibility* rather than observability is the hallmark of the real" (Barbour, 1966b: 170 – italics: Barbour). For Campbell, see Campbell, 1952.

compelling case here is Ernest Nagel. In order to illustrate and validate his arguments, Barbour frequently refers to Nagel throughout *Issues in Science and Religion*,[20] and, at first sight, Nagel seems to be highly influential. However, Nagel is considered by many as one of the major figures of logical empiricism, and Barbour seems to be unaware of this. Barbour, who vigorously argues against the logical empiricist movement, seems to be influenced by one of its major figures. Nevertheless, if one analyses these references to Nagel carefully, then Nagel does not seem to be represented in what Barbour puts forward as his view of critical realism.

Hence, conclusively determining the influence a particular philosopher has exerted on Barbour seems to be almost impossible; let alone measuring the amount of influence this philosopher has had on the development of critical realism. Despite certain distinct cases of exerted influence – such as Polanyi, Hanson, and the logical empiricist movement – there are a large number of sources where it is unclear whether or not and, if so, to what extent they have influenced Barbour, because Barbour himself is often indistinct about his sources.[21] As a result, a full reconstruction of the historical roots thus might well be unattainable.

1.2 Critical Realism and Family Resemblance: Similarities and Differences[22]

With the discussion of the historical origins and the rather critical assessment thereof complete, we can now turn to charting the evolution of critical realism in science-theology scholarship. Yet, before discussing the various branches of critical realism, we first need to have a metaphor for understanding the often complex relationships amongst those who endorse critical realism, because there is a risk of critical realism becoming an underdetermined catchphrase. Almost everyone seems to endorse some form of critical realism, but there are apparently subtle differences amongst the various critical realisms suggested in science-theology scholarship. A helpful metaphor here is understanding the various critical realisms and their relationships in terms of resembling a family, where we recognise the strong similarities amongst critical realism but also subtle differences. In this section, we will lay out the structure of such

[20] See e.g. Barbour, 1966b: 161, 170.

[21] For example, both the Nagel-case and the aforementioned Whitehead-quote illustrates this point.

[22] It is not my intention to provide an in-depth and exhaustive analysis of critical realism, because such an exploration will be offered in the following chapters. Here I offer brief and introductory sketches of various thinkers who have endorsed a form of critical realism.

a family-form classification and, in Section 1.4, a preliminary formulation of the basic stance of critical realism is outlined.

Let us first probe a bit deeper into this notion of family resemblance. In his *Philosophical Investigations*, Wittgenstein uses the idea of 'family resemblance' (*Familienähnlichkeit*) to illustrate how words can have meaning. The example Wittgenstein uses to explain the notion of 'family resemblance' is via various games.[23] What, Wittgenstein wonders, have board-games, card-games, ball-games and so on in common? They must have something in common, because we call each of these activities 'games'. But, Wittgenstein argues, there is nothing in these games that is common to all. Each of these games have elements that drop out in other games: not all games are meant to entertain, and not all games have a competitive element. Nevertheless, we still call them 'games'. Whilst there is nothing that is common to all games, except for the fact that we call them 'games', there are still strong enough similarities to group these activities under the same category. Wittgenstein calls these similarities 'resemblances', which ties these games into a single family. As Wittgenstein puts it, "I can think of no better expression to characterize these similarities than 'family resemblances'; for the various resemblances between members of a family: build, features, colour of eyes, gait, temperament, etc. etc. overlap and criss-cross in the same way" (Wittgenstein, 2009: §67). Games, therefore, are considered to represent a family, because we have the tendency to group games together on the basis of the fact that they resemble one another. Or, as Heather Gert puts it: "family resemblances are those salient resemblances which are fairly common to, or distinctive of, the members of a kind, and which we often use to identify members of that kind" (Gert, 1995: 183).

But how could we apply this idea of 'family resemblance' to our understanding of critical realism? Let us unpack the idea of understanding critical realism in terms of 'family resemblance' in more detail, starting with the '*pater familias*' Ian Barbour.

1.2.1 Barbour on Critical Realism

As already mentioned in the introductory remarks, Barbour was the first to introduce critical realism to the science-theology exchange. In his ground-breaking *Issues in Science and Religion*, published in 1966, Barbour sets out to suggest a series of

[23] See Wittgenstein, 2009: §66.

arguments about metaphysics, epistemology, and semantics. In later works, most notably *Myths, Models, and Paradigms* and his 1990 Gifford Lectures *Religion in an Age of Science*, Barbour elaborated and updated his arguments of 1966.

From the outset, Barbour positions his critical realism as an alternative to three competing views regarding the products of science: 'naïve' realism, instrumentalism, and idealism.[24] Each of these, according to Barbour, offers a mischaracterisation of the sciences. As Barbour puts it,

> Against the positivist, the realist asserts that the real is not the observable. Against the instrumentalist, he affirms that valid concepts are true as well as useful. Against the idealist, he maintains that concepts represent the structure of events in the world (Barbour, 1966b: 168).

Each of these schools of thought will be discussed comprehensively in the following Chapters 2, 3, and 4, but the common theme in Barbour, and the other critical realists, is the claim that critical realism is a more nuanced and multifaceted position.

What, then, is this alternative, multifaceted stance, according to Barbour? Against naïve realism, for example, critical realism recognises the pivotal role of the epistemic subject in engaging with the mind-independent reality. There is no 'raw' data because we engage with reality using our schemes and frameworks. As such, all data are considered to be theory-laden. Yet, reality and its objects remain scheme-independent, i.e. even if we did not exist, these objects would not cease to exist – pace idealism. Pace instrumentalism, our theories and models about this scheme-independent reality are considered to be serious, i.e. scientific theories have the property of being true or false, but we should not take them literarily, which means in the context of theology that theological models do not describe the divine exhaustively. Our models and theories are limited, providing tentative knowledge about reality and its furniture.

Underpinning Barbour's considerations is the aim to prove that "science is not as objective, nor religion as subjective", as it is often assumed to be; a common theme amongst critical realists (Barbour, 1974: 5). There are deep similarities between science and theology, and differences are understood in terms of degree, rather than

[24] See Barbour, 1966b: 162-171; *idem*, 1974: 34-38.

kind.[25] Hence, whilst science is portrayed as a more human enterprise, where the scientist as human actor is historically conditioned and passionately involved in scientific research, theology undergoes – as it were – a scientific make-over, according to which theology is defined in terms more akin to science. Like the scientists, theologians are engaged with developing theories and models to understand the divine reality, and these models and theories are grounded on 'theological data', i.e. religious experiences and narratives. All this then allows Barbour to argue for numerous similarities between both disciplines and to reject an absolute dichotomy between science and theology.

1.2.2 Peacocke and Polkinghorne Join the Family

Similar sentiments can be found in the work of Peacocke and Polkinghorne. Both Peacocke and Polkinghorne seem to share the strategy of Barbour of portraying science in more human terms, emphasising the social and psychological conditioning of the scientists in their research, as a means to demonstrate that there is no one single avenue to acquire knowledge. As Polkinghorne puts it, "there is no single epistemology" (Polkinghorne, 2011: 17). If this argument holds true, and critical realists aim to provide sustained arguments to warrant this claim, then theological knowledge could be positioned as one of the valid avenues to acquire knowledge about reality alongside the (natural) sciences. But, at the same time, both Peacocke and Polkinghorne also want to suggest an alternative to the traditional approaches used in theology. Rather than starting top-down, Polkinghorne and Peacocke both suggest that we should start with theological data, i.e. religious experiences and narratives, and we should formulate criteria for evaluating this data; an approach more akin to science.

Let us probe a bit deeper into the accounts of Peacocke and Polkinghorne, starting with Peacocke for historical reasons, i.e. Peacocke endorsed critical realism earlier than Polkinghorne did. In his Bampton Lectures[26] of 1979, his 1983 Mendenhall Lectures[27], and his 1993 Gifford Lectures,[28] Peacocke endorsed a critical realist stance akin to Barbour's set of arguments. For Peacocke, critical realism offers the most adequate framework for understanding the achievement of knowledge in both science

[25] See Barbour, 1974: 6.
[26] See Peacocke, 1979.
[27] See Peacocke, 1984.
[28] See Peacocke, 1993.

and theology.[29] Like Barbour, Peacocke recognises the limitations of our epistemic capabilities, pointing out that all knowledge is prone to error and revisable. In the case of theology, for example, Peacocke asserts that "theological concepts and models should be regarded as partial and inadequate, but necessary, and, indeed, the only ways of referring to the reality that is named as 'God' and to God's relation with humanity" (Peacocke, 1993: 14). Models and theories are never literal, but they provide partial and limited descriptions of reality. Using a somewhat similar rationale as Barbour does, Peacocke highlights the personal involvement of the knower and, thus, points out the impossibility of (natural) science to attain exhaustive and certain knowledge. As such, Peacocke shares with Barbour an interest in establishing a 'bridge' between science and theology, and he considers critical realism as the most appropriate strategy for doing so. As Peacocke puts it,

> [S]ince the aim of a critical-realist theology is to articulate intellectually and to formulate, by means of metaphor and model, experiences of God, then it behooves such a theology to take seriously the critical-realist perspective of the sciences on the natural, including the human, world. For on that theology's own presuppositions, God himself has given the world the kind of being it has, and it must be in some respects, to be ascertained, revelatory to God's nature and purposes. So, theology should seek to be at least consonant with scientific perspectives on the natural world. Correspondingly, the sciences should not be surprised if their perspectives are seen to be partial and incomplete and to raise questions not answerable from within their own purview and by their own methods, since there are other realities – there is a Reality – to be taken into account which is not discernible by the sciences as such. A critical-realist science and theology cannot but regard themselves as mutually interacting approaches to reality (Peacocke, 1993: 21).

However, as the previous quotation shows, Peacocke is particularly interested in a *theological critical realism* that learns from a similar approach in (philosophy of) science, whereas Barbour seems to be more concerned with religion in general. As such, Peacocke seems to be less interested in a more comprehensive account of critical

[29] See e.g. Peacocke, 1984: 34.

realism than Barbour. Whilst clearly recognising the importance of an interdisciplinary approach, Peacocke seems to be mainly interested in proposing a new understanding of systematic theology. As Allen puts it, "the interdisciplinary and epistemological concern of critical realism thus plays a secondary role in framing Peacocke's more theologically oriented inquiry" (Allen, 2006: 26). These differences in approach between Barbour and Peacocke become apparent in their discussion of critical realism. Whereas Barbour sets out to describe critical realism as a 'philosopher', i.e. trying to give an account of scientific and theological practice, Peacocke seems to be much more of a 'theologian', because Peacocke's critical realism is developed whilst discussing theological issues, such as panentheism. Hence, rather than emphasising the epistemic position of theology alongside the (natural) sciences, Peacocke set outs to rethink theology in light of the then recent developments and challenges posed by (philosophy of) science.

Such an approach is very much similar to the work of Janet Soskice in her *Metaphor and Religious Language*, where she uses the then-recent developments in philosophy (particularly philosophy of language) to inform her views on religious language; what is more, Peacocke seems to use Soskice as a kind of blueprint for his thinking on theology, whereas Barbour hardly ever mentions Soskice. As a result, issues regarding semantics seem to be much more significant to Peacocke compared to Barbour. As Allen puts it, "in general, then, Peacocke's articulation of critical realism resembles Barbour's, although there is marginally more dependence upon a theory of language and the theological utility of models than is the case with Barbour" (Allen, 2006: 26). But, Soskice is not the only example of someone who is significant for Peacocke but less so for Barbour. For Peacocke, philosophers such as Ernan McMullin, Hilary Putnam, and Iain Hacking have helped him in shaping his thoughts with regard to critical realism, and in particular Soskice.[30] As such, Peacocke's critical realism seems to be developed without much dependence on Barbour, despite a number of strong similarities between Barbour and Peacocke.

Similar to Barbour and Peacocke, Polkinghorne uses the same *modus operandi*: pointing out the fallacious accounts of those who consider science as the only valid way of acquiring knowledge, emphasising the strengths and relevance of theology, and

[30] See Peacocke, 1984: 22-29.

endorsing critical realism as underpinning his endeavour of establishing an interdisciplinary relationship between science and theology. As Polkinghorne puts it,

> Like most scientists, I believe that the advance of science is concerned not just with our ability to manipulate the physical world, but with our capacity to gain knowledge of its actual nature. In a word, I am a realist. Of course, such knowledge is to be a degree partial and corrigible. Our attainment is verisimilitude, not absolute truth. Our method is the creative interpretation of experience, not rigorous deduction from it. Thus, I am a critical realist (Polkinghorne, 1998: 104).

Similarities between Barbour, Peacocke, and Polkinghorne are striking. Polkinghorne also considers reality to exist independently of the human mind, but at the same time all knowledge claims are considered to be scheme-dependent. As a result, our knowledge claims provide only a partial description of reality and all knowledge is considered to be prone to error. There is no absolute certainty, Polkinghorne maintains. Similar to Barbour and Peacocke, Polkinghorne considers this critical realist strategy is applicable to both science and theology; what is more, critical realism in theology is modelled on its 'cousin' in the sciences.

However, there are – as discussed above – differences between Barbour and Peacocke, but there also differences between Barbour/Peacocke and Polkinghorne. We will explore these differences more in-depth in Chapter 4 'Models, Symbols, and Analogies', because these differences emerge particularly on the level of semantics. Let me offer a kind of sneak preview: Polkinghorne takes a different semantic stance on two matters. First, whereas Barbour and Peacocke defend the use of metaphors in science, Polkinghorne calls this into question. As Polkinghorne puts it, "science makes frequent use of models. I doubt whether it makes much, if any, use of metaphor" (Polkinghorne, 1996a: 20). For Polkinghorne, theology is indeed deeply embedded in metaphorical language; a position that is also shared by Barbour and Peacocke. Second, Barbour and Peacocke argue that models have serious ontological pretensions, i.e. models provide an ontological account of reality. Peacocke, for example, considers models as 'candidates of reality'. Polkinghorne, on the other hand, denies the ontological pretentions of models. He takes a more instrumentalist stance, arguing that models should be understood in terms of heuristic devices. There are, thus, both

similarities and differences between the critical realisms of Barbour, Peacocke, and Polkinghorne, but how could the notion of family resemblance help us to understand their relationships?

1.2.3 Why should we consider Barbour, Peacocke, and Polkinghorne as Resembling a Family?

I have introduced the notion of 'family resemblance' to understand the relationships of the critical realisms of Barbour, Peacocke, and Polkinghorne, and I have provided some support for the usefulness of this notion, but are there more arguments to support such an understanding? First and foremost, Barbour, Peacocke, and Polkinghorne recognise their partnership concerning critical realism.[31] As Barbour puts it in a more biographical tone:

> In *Issues in Science and Religion* (1966) and *Myths, Models, and Paradigms* (1974), I defended critical realism in science and suggested parallels in the status of religious language. I examined the role of analogies and models in both scientific and religious thought. I argued that statements about God are neither useful fictions nor literal descriptions. Peacocke advocated an identical epistemology in *Intimations of Reality* (1984). Polkinghorne mentioned critical realism in science in *One World* (1986) and subsequently defended it in both science and religion (Barbour, 2012: 13-14).

Or, as Polkinghorne puts it: "this last remark reminds us that it is a *critical* realism that the scientist-theologians [i.e. Barbour, Peacocke, and Polkinghorne] defend. No naïve objectivity is involved in either discipline", whilst referring to the work of Peacocke (Polkinghorne, 1996a: 14).[32] But one might argue that Peacocke got the idea of critical realism from Soskice, rather than Barbour. As discussed above, a common understanding in the science-theology exchange is to claim that Peacocke is highly influenced by Soskice, which is likely to be true.[33] However, Peacocke already qualified himself as a 'critical realist' even before Soskice entered the debate. In his 1979 *Creation and the World of Science*, Peacocke claims to endorse critical realism

[31] See e.g. Polkinghorne, 1991: 4; *idem*, 1996: 11-15.
[32] Polkinghorne refers to Peacocke, 1984: 25. Italics: Polkinghorne.
[33] See e.g. Peacocke, 1984: 30 n.34.

as the appropriate strategy for understanding science and theology, and he refers to Barbour as his source in the footnotes.[34] Thus, even amongst Barbour, Peacocke, and Polkinghorne, they recognise their mutual partnership in endorsing critical realism in science-theology scholarship.

Furthermore, also amongst those who studied critical realism, the default position seems to be to take Barbour, Peacocke, and Polkinghorne as a single foundational group that defends critical realism. In *Ernan McMullin and Critical Realism*, Paul Allen, for example, argues that Barbour, Peacocke, and Polkinghorne are on a common quest to find a "cognitive and epistemological basis to theological claims regarding the natural science". What is more, Allen maintains that "they hold a common position on the nature of knowledge", i.e. a critical realist theory of knowledge (Allen, 2006: 13, 14). We find a similar categorisation of Barbour, Peacocke, and Polkinghorne in Russell,[35] Gregersen,[36] Knight,[37] and Losch.[38] According to Losch, for example, "Arthur Peacocke and John Polkinghorne used Barbour's idea of critical realism as an underlying concept of their approaches to science and theology"; or "critical realism is not only Barbour's, but also Polkinghorne's paradigm of work and Peacocke's philosophy of choice" (Losch, 2010: 394; *idem*, 2009: 85). Not only do Barbour, Peacocke, and Polkinghorne consider themselves as – what I would call – resembling a family, but commentators on critical realism agree that we should consider them as a single group in the science-theology exchange.

Even though critical realists recognise their partnership in endorsing critical realism, and others consider Barbour, Peacocke, and Polkinghorne as the three key figures in the critical realist debate, this does not imply that there are no differences in the accounts of Barbour, Peacocke, and Polkinghorne. As the notion of 'family resemblance' suggests, family resemblance is not about a strict homogeneous group that has all things in common. On the contrary, we recognise that there are significant differences between Barbour, Peacocke, and Polkinghorne, whilst also maintaining that there are enough salient and distinctive features to consider them as a single family of critical realism.

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[34] See Peacocke, 1979: 22.
[35] See Russell, 2004: 45-48.
[36] See Gregersen, 2004: 77.
[37] See Knight, 2012: 623-624.
[38] See Losch, 2009: 85, 89-92; *idem*, 2010: 393-394.

Let me mention a number of these differences. First and foremost, there are clear differences on the level of discourse. Allen aptly recognises this by claiming that "although each Gifford Lecturer [i.e. Barbour, Peacocke, and Polkinghorne] defends critical realism with common terms and references, each of them develops the term with respect to different discourses" (Allen, 2006: 14). But where do these differences emerge? According to Allen, differences emerge on the level of purpose that these critical realists have in mind, and he continues his analysis by pointing out that

> Barbour develops the term critical realism in relation to religion and religious claims from its usual locus in science. Peacocke develops critical realism in relation to a theological systematics that depends, for its part, on a biologically oriented theological anthropology. Polkinghorne develops critical realism in relation to the basic claim that faith is reasonable (Allen, 2006: 15).

Critical realism is then used to offer the philosophical grounding for their purposes, which is very significant here. Despite the fact that Barbour, Peacocke, and Polkinghorne engage in science-theology scholarship with a different purpose in mind, they all consider critical realism as a helpful mechanism to ground their endeavours.

But there are also other differences that should be accounted for. A significant difference between Barbour, Peacocke, and Polkinghorne is the sources used to develop their respective critical realism. Whilst some sources are shared, e.g. Peacocke and Polkinghorne relying on Barbour, some sources are unique to the respective scientist-theologian. Peacocke, for example, heavily relies on the work of Soskice in developing his critical realism, whereas Barbour and Polkinghorne do not engage with Soskice in any significant way. Polkinghorne, on the other hand, is highly influenced by Michael Polanyi and Torrance, compared to Barbour and Peacocke.

Furthermore, all three have a different theological orientation. Barbour is very much leaning towards a kind of process theology, according to which God affects but is also affected by his creation. As a result, Whitehead is very significant for Barbour in his engagement with the science-theology community.[39] Contrary to Barbour's process theology, Peacocke endorses panentheism, which allows him to hold together God's transcendence and immanence. Panentheism asserts that "the world is 'in' God,

[39] See Barbour, 1966b: 452-463. See also Losch, 2009: 89-90.

but that his being is not exhausted by the world" (Peacocke, 1979: 45). Polkinghorne, on the other hand, seems to take a more traditional approach to Christianity. As Knight puts it, "Polkinghorne remains a staunch defender of Nicene Trinitarianism"; or, "on the subject of Christ himself, Polkinghorne is a defender of a traditional position" (Knight, 2012: 627). But also in his own work, Polkinghorne seems to adopt a more traditional theism. He, for example, organises his Gifford Lectures (i.e. *The Faith of a Physicist*) around the Creeds, taking a creedal theological approach to develop his views on God; an approach that is lacking in Barbour and Peacocke. Whilst critical realism still remains their common approach to these debates, their theological orientation is at least significant for explaining some of their differences.

Finally, there are also some more specific differences between these three critical realists. As discussed above, Polkinghorne, for example, is sceptical about the role of models in theology and whether or not science uses metaphors, both of which are defended by Barbour and Peacocke. We will address these differences in the relevant chapters.

Some of these differences are important for understanding the underlying mechanisms of their endorsement of critical realism. Each scientist-theologian seems to have a particular agenda in mind, such as a particular discourse and purpose, but their common strategy is their endorsement of critical realism as a key part for realising their own agenda. With the notion of 'family resemblance' in hand, we recognise these differences, but there are also significant elements that allow us to consider Barbour, Peacocke, and Polkinghorne as being part of a critical realism family. Yet, what are these elements that Barbour, Peacocke, and Polkinghorne have in common? Could we suggest a particular view on certain philosophical stances that are shared amongst these critical realists, i.e. turn critical realism into a kind of 'school of thought'? Before doing so, we first need to explore more recent developments concerning critical realism, and also discuss two key figures that are significant for understanding the critical realism that Barbour, Peacocke, and Polkinghorne seem to envision, yet they are only indirectly part of this 'family resemblance'. Both of these sections will help us in formulating some core philosophical principles of the critical realism that we explore in this research. Let us probe a bit deeper into more recent developments first.

1.2.4 Recent Developments in the Literature on Critical Realism

In more recent times, three approaches have emerged with regard to critical realism in science-theology scholarship. There are those, such as Southgate and Poole, Peters and Peterson, and Wentzel van Huyssteen[40] who are still in line with critical realism as set out by Barbour, Peacocke, and Polkinghorne. These authors reconfirm and restate the philosophical endeavours of the – what might be called – 'standard account' of critical realism.

Others, however, have intended to develop and advance the concept into new directions, most notably Kees van Kooten Niekerk, Paul Allen and Andreas Losch. Van Kooten Niekerk, Allen and Losch are critical about the rather direct transferring from (philosophy of) science to theology. According to Barbour, Peacocke, and Polkinghorne, then-recent developments in philosophy of science could shed new light on theology and its methods, a theme that we will discuss in more detail in Chapter 7 'The Scientisation of Theology'. But this transferring is highly problematic. As Allen puts it,

> the rejection of critical realism by thinkers such as Willem Drees, and to a lesser extent Wentzel van Huyssteen, may in fact be the rejection of a term that has been insufficiently developed. This is particularly the case with respect to theology. Critical realism has yet to be fully transposed from an explanatory context in the philosophy of science into an interdisciplinary setting suitable for the science-theology dialogue (Allen, 2006: 41).

Or, in the words of van Kooten Niekerk:

> Thus, generally speaking, theological statements have another nature than scientific statements. Whereas scientific statements are (or purport to be) statements of facts, theological statements include valuations. Therefore, it is prima facie not obvious that critical realism as a theory of factual or theoretical knowledge can be transferred from science to theology (van Kooten Niekerk, 1998: 70).

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[40] See e.g. van Huyssteen, 1989; Southgate and Poole, 2011: 16; Peters and Peterson, 2013. However, van Huyssteen has become rather critical about critical realism and eventually he rejected the concept.

Van Kooten Niekerk, Allen and Losch set out to develop a more comprehensive account of *theological critical realism* by rejecting the direct transferring of philosophy of science to theology. According to van Kooten Niekerk, Allen and Losch, we should understand the relationship between science and theology more in terms of independence, rather than being akin to one another. There are fundamental differences in kind between science and theology, which we should recognise at the start. As such, we should develop a view of theology using the tools and vocabularies of theology, rather than turning to philosophy of science. However, since this direct transferring is central to the account of critical realism as envisioned by Barbour, Peacocke, and Polkinghorne, van Kooten Niekerk, Allen and Losch will generally fall outside the scope of this research, but, if their contributions to the debate are relevant for a better understanding of critical realism, we will turn to their work in order to inform our explorations of critical realism.

There has also been a third development in the literature on critical realism, but – again – this will also fall outside the scope of this research: Alister McGrath's critical realism.[41] Since McGrath is highly influential in the science-theology scholarship, and since he also claims to endorse a form of critical realism, we will turn very briefly to his account of critical realism. However, due to his strong reliance on Roy Bhaskar, McGrath's critical realism should be considered very distinct from the respective critical realisms of, say, Barbour, Peacocke, and Polkinghorne, because Bhaskar is lacking in these accounts. According to McGrath, we should advance critical realism in science-theology scholarship by turning to the critical realism of Bhaskar.[42] For McGrath, "there is clearly a need for a radical reappraisal of existing approaches and paradigms, which is best achieved by engaging one specific form of critical realism which has demonstrable merits for this purpose", which is the critical realism as proposed by Bhaskar (McGrath, 2002: 208-209). Why is this the case? McGrath assumes that the current science-theology exchange has been developed in a – what

[41] McGrath falls outside the scope of this research because he is rather unique in relying on the philosophy of Bhaskar.

[42] McGrath presents Bhaskar as one of the key figures in philosophy of science, even defining Bharkar's work as a 'Copernican Revolution' in the study of the sciences. As McGrath puts it, Bhaskar's *A Realist Theory of Science* "is increasingly recognized as one of the most important philosophical works to have been published in recent years" (McGrath, 2002: 209). Whilst it is true that, in particular in sociological studies, Bhaskar's philosophy has received a warm reception, mainstream philosophy of science does not seem to engage with Bhaskar's critical realism as references to his philosophy seems to be lacking in the literature. As a matter of fact, McGrath does not provide any references to support his claim about the importance of Bhaskar, leaving us to guess as to who he refers to.

McGrath calls – 'intellectual insularity' manner, where participants of the dialogue between science and theology fail to engage with relevant debates in wider academia.[43] As a result, much of the science and theology dialogue has become irrelevant to the mainline academic community. In order to resolve this issue, McGrath, thus, suggests an in-depth engagement with Bhaskar's critical realism. Bhaskar's alternative is important for McGrath, as it "offers all the virtues of the themes explored by Barbour and others, while having the considerable advantage of operating within the academic mainstream, rather than what many have regrettably come to view as an unfashionable intellectual backwater" (McGrath, 2002: 208).[44]

What, then, is McGrath's alternative? Whilst discussing Bhaskar extensively in his second volume of *A Scientific Theology* in order to ground critical realism in mainstream academia, McGrath seems to be mainly interested in Bhaskar's notions of 'epistemic fallacy' and the stratification of reality, according to which reality is multi-layered. First, in McGrath's reading of Bhaskar, he defines the 'epistemic fallacy' as a "gross confusion of epistemology and ontology, which rests on the false assumption that the structures of the world rest or depend upon human observation" (McGrath, 2002: 212). There is more than meets the eye – as it were – because observation is not the only determinant in deciding if *x* exists. This state of affairs, then, allows McGrath to suggest that God's existence is not dependent upon human observation.[45] Second, and consequent upon the first, reality is multi-layered, McGrath argues. With the 'epistemic fallacy'-argument in hand, McGrath wants to give theology a more solid foundation as the most basic stratum of the stratified reality to which all other (academic) disciplines respond and are grounded upon. Hence, McGrath's critical realism allows him to renegotiate the demarcations within academia between science and theology, and give theology – or at the least the God-stratum – ontological primacy over any other strata. Hence, McGrath's alternative offers a theological appropriation of Bhaskar's critical realism in order to reposition the isolated place of the science-theology exchange to the centre of mainstream academia.[46] But, as mentioned above,

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[43] See McGrath, 2002: 208. However, McGrath's analysis is actually not true, because Soskice has already engaged in depth with Bhaskar's philosophy in developing her critical realism. See Soskice, 1985: 120-124.

[44] See McGrath, 2002: 200, where he points out that Bhaskar's critical realism is used as means to reposition the (natural) sciences to its historical place as *ancillae theologiae*.

[45] See Gironi, 2012: 61.

[46] Gironi illustrates this rather vividly as "maintaining accordance with the tradition of scientist-theologians but paying lip service to philosophical relevance" (Gironi, 2012: 58).

none of the other critical realists – the exception here is Soskice – in science-theology scholarship engage on such a fundamental level with Bhaskar, and, as a result, McGrath will not be discussed in much detail in the following chapters.

1.2.5 The Outer Circle of the Family: Those who are not in the Science-Theology Community but endorse a form of Critical Realism and have Influenced the Development of Critical Realism in Science-Theology Scholarship

In addition to Barbour, Peacocke, Polkinghorne, and more recent endorsements of a form of critical realism, there have also been others who are important for our present study. This 'outer circle' consists of those who endorse a form of critical realism and have influenced the development of critical realism in the science-theology exchange, but who do not seem to be influenced by Barbour, Peacocke, and Polkinghorne to the extent that there is no textual evidence to support such an influence. Furthermore, in the discussions on critical realism in science-theology literature, those who belong to the 'outer circle' are not recognised as being part of the group of Barbour, Peacocke, and Polkinghorne. However, ignoring the 'outer circle' jeopardises our attempt to provide a comprehensive account of critical realism, because they could inform our thinking on critical realism and – for some – has influenced critical realists of the 'inner circle'. In this section, I will discuss two examples of the 'outer circle', namely Janet Martin Soskice and Langdon Gilkey.

The prime example of a thinker who endorses critical realism in theology, but who is also relevant to the science-theology exchange, is the earlier mentioned Janet Martin Soskice. In her *Metaphor and Religious Language*, Soskice sets out to explore the nature of metaphor, engaging with historical sources and using more recent works in philosophy of language. After very well-crafted chapters on metaphors in general, where she suggests that we should understand metaphors in terms of "*that figure of speech whereby we speak about one thing in terms which are seen to be suggestive of another*", Soskice turns to theological realism regarding 'reality depiction' and 'metaphorical terms', using recent works in philosophy of language and philosophy of science (Soskice, 1985: 15).[47] In these final chapters, Soskice sets out to answer how models and metaphors should generally be understood as 'reality depicting' and – importantly for Soskice – that this also applies to models and metaphors in theology.

[47] Italics: Soskice. For a more comprehensive account of Soskice's thinking about metaphors, see Chapter 4 'Models, Symbols, and Analogies', see p. 117-121.

For Soskice, theological statements make truth claims about an objective, mind-independent reality, whilst also recognising that no particular statement is exhaustive in its description. As Soskice puts it, "we are saying that the theist can reasonably take his talk of God, bound as it is within a wheel of images, as being reality depicting, while at the same time acknowledging its inadequacy as description" (Soskice, 1985: 141). This, according to Soskice, is the position a critical realist in theology takes.

What are the grounds then for positioning Soskice in the 'outer circle' of the family resemblance, if her account bears a resemblance to the critical realism of the 'inner circle'? First and foremost, on the occasions where Soskice engages with Barbour's views on critical realism, she is rather critical of Barbour. On the first occasion, Soskice accuses Barbour of conflating the categories of 'models' and 'metaphors'.[48] On the second occasion, Barbour, according to Soskice, suggests a false generalisation about the dispensability of scientific models in the process of merging into scientific theories. Following Hesse, models are vital to scientific theories, Soskice maintains, because scientific models are pivotal in the interpretation of theories; a feature not recognised by Barbour, according to Soskice. Hence, where Soskice engages directly with Barbour, she is rather critical about his views concerning models, metaphors, and theories.

Whilst being critical of Barbour, an argument could be developed to point out that Soskice borrowed the terminology, i.e. 'naïve' and 'critical' realism, from Barbour. Whilst it is difficult to conclusively disprove such a claim, we could look at the textual evidence and the sources used by Soskice in developing critical realism to debunk this claim. Pivotal in disproving the claim that Soskice might have borrowed the terminology from Barbour is the fact that Soskice neither mentions Barbour nor refers to his work in introducing the concept of critical realism. Soskice introduces 'critical realism' as an alternative to 'naïve realism' after the chapter in which she criticises Barbour. But, to whom does Soskice refer in introducing critical realism? Soskice turns to philosophers (of science) for developing her critical realism, most notably Mary Hesse, Hilary Putnam, and Roy Bhaskar.[49] However, none of these philosophers use – as far as I can see – similar terminology to Barbour, which also applies to Bhaskar, who uses 'transcendental realism' and 'critical naturalism' that are then

[48] See Soskice, 1985: 101. We will discuss this in more detail in Chapter 4 'Models, Symbols, and Analogies', see p. 117-121.
[49] See Soskice, 1985: 123.

joined into 'critical realism' in later works.[50] There is, thus, no reference to critical realism in the pages where Soskice engages with Barbour's thinking. Yet, where she does mention critical realism, she turns to philosophers of science for her critical realism. As such, it is rather difficult to pin point down exactly where Soskice got her terminology from, but – with the lack of textual evidence – it is difficult to argue that she borrowed her terminology from Barbour.

But, if Soskice did develop her critical realism in isolation from Barbour, Peacocke, and Polkinghorne,[51] why should we engage with her literature in this research? There are at least two reasons for doing so. First, as already discussed above, Soskice has been particular influential in Peacocke's account of critical realism. Peacocke recognises rather explicitly the significance of Soskice for his own thinking. As Peacocke puts it,

> I am greatly indebted to Dr. Soskice for making her thesis available to me. As I hope my references show I have been greatly impressed by her argument, only an outline if which I had myself previously partly developed (Peacocke, 1984: 30n.34).

As a result, through her influence on Peacocke's critical realism, Soskice has been influential in the development of critical realism in science-theology scholarship, and, as such, we should use her views on critical realism to inform our thinking about this concept.

Second, there are some very striking similarities between Soskice and the accounts of Barbour, Peacocke, and Polkinghorne, which actually complicates the above quest into the somewhat complicated relationship between Barbour and Soskice. Whilst Soskice is critical of Barbour on semantic terms, her approach is very much similar to Barbour and the other critical realists, and there are also striking similarities on their metaphysical and epistemological stance. As we will discuss in the following chapters,

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[50] Soskice is actually not the only one who considers Putnam to be a 'critical realist'. Already in his early work, Peacocke suggests that Putnam is an example of his 'qualified' or 'sceptical' realism. See Peacocke, 1979: 21.

[51] We have discussed the relationship between Barbour and Soskice in the previous section, but what about Peacocke and Polkinghorne? Polkinghorne entered the science-theology exchange after Soskice in the mid-1980s, and, thus, he could not have influenced Soskice. Peacocke, on the other hand, explores critical realism in his *Creation and the World of Science*, which is published in 1979. However, Soskice does not mention Peacocke in her *Metaphor and Religious Language*.

both Soskice and the other critical realists seem to endorse the scheme-dependent nature of our knowledge claims, whilst recognising that the object to which these claims refer exist mind-independently. Furthermore, both Soskice and the other critical realists endorse epistemological fallibilism as the most appropriate stance in epistemology. But there are also significant similarities regarding their methodology. Both Soskice and the other critical realists consider developments in philosophy of science as highly relevant for understanding theology; what is more, they all seem the share an optimism towards directly transferring philosophy of science to theology. We will explore this in more detail in Chapter 7 'The Scientisation of Theology', but endorsing such a direct transferring of science to theology is – at the least – a striking similarity between Soskice and the other critical realists. Thus, in addition to the fact that Soskice and the other critical realists share a similar terminology, there are also striking similarities regarding a number of philosophical commitments and their methodology used for understanding theology. As such, we should consider Soskice as highly relevant for our quest of understanding critical realism.

Another theologian who endorses a form of critical realism is Langdon Gilkey. In his *Nature, Reality, and the Sacred*, Gilkey sets out to attack the rather naïve views of those who endorse scientism, according to which science is the only reliable way of answering all life's fundamental questions. Rather than claiming that science exhaustively defines reality in itself, Gilkey is more sceptical about the capabilities of science. He recognises that "science is our most reliable and, on one level, our most fruitful way of knowing", but the problem with those endorsing scientism is that they ignore the pivotal role of the human mind in engaging with reality (Gilkey, 1993: 15). Science, for Gilkey, is dependent on the epistemic subject, who is himself culturally and historically conditioned, and he turns to Thomas Kuhn, Michael Polanyi, and others to sustain his argument. As a result, all knowledge claims offer a "perspective – relatively valid, to be sure – on what is there; none is a simple mirror of what is" (Gilkey, 1993: 31). There are no theory-neutral or theory-free observations, and all knowledge claims are considered to be fallible. This state of affairs brings Gilkey to endorsing – what he calls – critical realism. For Gilkey, critical realism stands for "the view that experience and knowing are a response to an external world but also a response in human signs, symbols, categories, i.e. in human language" (Gilkey, 1993: 29n.33). Thus far, all this seems to be very similar to the accounts of Barbour, Peacocke, and Polkinghorne.

But why, then, do we consider Gilkey as being part of the 'outer circle', rather than in line with Barbour, Peacocke, and Polkinghorne? There are at least two reasons for doing so. First, contrary to Barbour, Peacocke, and Polkinghorne, Gilkey takes a more independent position regarding the relationship between science and theology. Whereas Barbour claims that "writings in philosophy of science have had major repercussions in the philosophy of religion", Gilkey seems to disagree here (Barbour, 1974: 3). According to Gilkey, we should understand science and theology on their own terms and conditions; a sentiment shared with Allen and Losch. As Gilkey puts it,

> Science is understood when its theories are understood on their own terms and in the light of their own evidence, and those theories are then assented to as (probably) true or rejected as false. The same mode of assessment should be (but is not) the case with regard to philosophy and religion (Gilkey, 1993: 41).

Gilkey, then, continues to allocate a specific area of study to each of these disciplines by arguing that:

> Briefly put, science seeks (on the basis of some preunderstanding) the invariant structures of specific ontic processes, and it appeals to sensory, quantitative data for both its materials and its forms of validation. Philosophy seeks (from some chosen perspective) the universal structures of all that is, and it appeals to the entire width of experience; philosophy thus criticizes, formulates, and reformulates the principles presupposed in science and in all the arts. Theology, on the basis of one perspective on existence, seeks the meaning of the structures provided by the sciences and envisioned by philosophy (Gilkey, 1993: 75-76).

However, the fact that Gilkey does not seem to transfer his philosophy of science to theology does not mean that Gilkey is a defender, say, of Stephen Jay Gould's 'Non-Overlapping Magisteria'. On the contrary, Gilkey does recognise the importance of science for theology. Good theology should also be based upon science, whilst science leads to questions that demands a more theological approach. Therefore, whilst the basic rationale might be similar to Barbour, Peacocke, and Polkinghorne, i.e. recognising limitations of the epistemic subject and its pivotal role in acquiring

knowledge, Gilkey is not so much interested in transferring his philosophy of science to theology.

But, second, there is also another point of difference between Gilkey and these other critical realists; an argument similar to Soskice. Barbour, Peacocke, and Polkinghorne do not seem to have any significant role in Gilkey's elaboration of critical realism. Even though he does mention the works of Barbour and Peacocke in his bibliography, it is rather difficult to trace down where Gilkey got the terminology from. As far as I can see, Gilkey engages particularly both with Kantian scholars, and those who are part of the 'American critical realism', with key thinkers such as Roy Wood Sellars and George Santayana.[52] Gilkey also engages with the works of Alfred North Whitehead, but Gilkey is not interested in endorsing Whiteheadian process theology, and Paul Tillich is important for Gilkey. There is, thus, no textual evidence for arguing that Gilkey grounds his critical realism on the work of Barbour, Peacocke, or Polkinghorne.

But those who are part of the outer circle of the 'family resemblance' share many features with the 'inner circle', consisting of Barbour, Peacocke, and Polkinghorne. Let me mention a few of these similarities. First and foremost, all are critical about naïve realism, claiming that such a naïve stance misrepresents science. With their commitment to a fallibilist epistemology, all critical realists recognise the epistemic limitations of the knowing subject. All knowledge claims are considered to be prone to error, which also applies to the surest theories of science. Furthermore, both the 'inner' and 'outer circle' recognise that science and theology are somehow cousins in the cognitive life. We should not discard theology as 'unscientific', or consider science as being able to answer satisfactorily all life's fundamental questions. There is neither a single epistemology nor a privileged avenue to acquire knowledge. Both scientific and theological knowledge have their place in our quest of understanding reality.

What, then, is the role of Soskice and Gilkey within this doctoral thesis, if we consider them as belonging to the outer circle? Both Gilkey and Soskice can help us understand critical realism more comprehensively. Critical realism is a very nuanced and multifaceted position and studying the works of others (who also have read at least Barbour, according to their bibliographies) can provide helpful insights for understanding critical realism. Furthermore, and this applies to Soskice especially, we

[52] For this branch of critical realism, see Drake et al., 1920.

should engage with her literature, because Peacocke could strongly relate to Soskice's thinking. Peacocke seems to identify his critical realism as being highly indebted to Soskice, in addition to the critical realism of Barbour. Therefore, looking at Soskice and Gilkey – in addition to Barbour, Peacocke, Polkinghorne, and others – will be helpful for understanding critical realism, but we should also recognise – as we did above – their differences with the critical realisms of Barbour, Peacocke, and Polkinghorne.

1.3 A Preliminary Formulation of Critical Realism

In the above sections, we have introduced the notion of 'family resemblance' to characterise the relationship amongst those who endorse critical realism, most notably Barbour, Peacocke, and Polkinghorne. A particular helpful definition of 'family resemblance' has been provided by Gert's reading of Wittgenstein, according to which "family resemblances are those salient resemblances which are fairly common to, or distinctive of, the members of a kind, and which we often use to identify members of that kind" (Gert, 1995: 183). We have discovered several differences in the accounts of Barbour, Peacocke, and Polkinghorne, alongside their mutual dependency, but also that various other accounts of critical realism, e.g. Soskice and Gilkey, should not be considered as stemming from the accounts of Barbour, Peacocke, and Polkinghorne. But would that mean that Soskice and Gilkey are not part of the critical realism-family, as envisioned by Barbour, Peacocke, and Polkinghorne? In order to make a sustained judgment here, we need to have a clear understanding of the *distinctive elements* of critical realism, i.e. what does it mean to be a critical realist in line with Barbour, Peacocke, and Polkinghorne? In this section, we will provide a kind of working definition of critical realism by analysing a number of distinctive elements of critical realism regarding its methodology and its stances on metaphysics, epistemology, and semantics.[53]

Before we provide a taxonomy of critical realism, let us first have a closer look at another pivotal concept in the critical realist' literature, namely naïve realism. Throughout their oeuvre, critical realists present critical realism as a more sophisticated position than naïve realism, but critical realists fail to provide any textual evidence for who these naïve realists actually are. As such, naïve realism seems to

[53] I do not intend here to provide a full analysis of each of these stances, because we will explore the methodological and philosophical commitments of critical realism in the following chapters.

function as a strawman, which critical realists can easily knock-down. But what is naïve realism then? I believe we should understand the critical realist interpretation of naïve realism as incorporating three stances:

1. Metaphysical stance: naïve realism argues for an immediate relationship between the human mind and reality. We are able to uncover the hidden structures of reality-in-itself, without any involvement of conceptual frameworks. As such, our knowledge claims are considered to be theory-free or – at least – theory-neutral.
2. Epistemological stance: naïve realists believe that we could attain conclusive and exhaustive knowledge; a position often called 'infallibilism'. Once science has proven a particular theory, it becomes a permanent part of the collective body of scientific knowledge.
3. Semantic stance: literalism is the position that a naïve realist seems to take, according to which our linguistic concepts exhaustively and definitively describe the objects to which they refer. Our theories and models provide exact descriptions of reality.

We use naïve realism frequently throughout this thesis and we will explore each of these three stances of naïve realism in the following chapters.

With our taxonomy of naïve realism now complete, we can now turn to critical realism. With very broad strokes, I take the critical realism that we will explore in this study to incorporate four stances. Let me first mention the first three:

1. Metaphysical stance: critical realists believe that reality and its objects exist independently of the human mind, hence 'realism'. But our knowledge claims about this reality (both physical and divine) are scheme-dependent, i.e. we engage with reality through our conceptual frameworks.
2. Epistemological stance: a critical realist would maintain that all knowledge (both scientific and theological/revelatory) is considered to be prone to error. We can never provide exhaustive and full justification for our knowledge claims, which also applies to even the surest theories of science.
3. Semantic stance: the critical realist semantic stance gravitates around the principle to take our theories and models 'seriously, but not literally'. Resulting from their fallibilistic epistemology, our language can never fully or infallibly describe the

objects to which it refers. We should recognise the epistemological limitations of the human mind, and, as a result, our linguistic concepts only partially represent certain aspects of reality.

All critical realists endorse these three core stances. But, what seems to set Barbour, Peacocke, Polkinghorne, and – to a similar extent – Soskice apart is their commitment to the fourth stance.

4. Methodological stance: critical realism is first and foremost a philosophy of science, but we should directly transfer it to the context of theology. Critical realism as a philosophy of science can be used constructively in our reflections on theology and its methods; what is more, critical realism in science should be applied to theology to ward off existential threats on theology as an academic discipline.

As discussed above, whilst most critical realists in science-theology scholarship seem to endorse this fourth stance, other critical realists have been rather sceptical about transferring philosophy of science to theology. Examples of those who are sceptical about transferring philosophy of science to theology are Allen, Losch, and Gilkey. But, for the – let us call this – 'inner circle', consisting of Barbour, Peacocke, and Polkinghorne, this fourth stance is central, and we should also mention Soskice here.[54] For them, critical realism is an epistemological breakthrough that allows them to place science and theology on equal epistemic footing. As such, I consider the fourth commitment significant for the critical realism that we will explore in this study.

In referring to critical realism in the following chapters, I have this notion of 'family resemblance' in mind. Not all critical realists are alike, and we should recognise the sometimes significant and subtle differences between various branches of critical realism. As mentioned above, Polkinghorne takes a different stance with regard to the ontological pretentions of models, but at the same time he argues – in line with Barbour and Peacocke – against a more naïve realist understanding of models and he uses a similar rationale in doing so. The same holds true for those not endorsing the fourth stance: there is enough evidence (textual and on the level of arguments) to consider

[54] Despite the fact that Soskice seems to agree with this fourth stance, she is not part of this inner circle for reasons given above.

them part of the 'family resemblance'. In resembling a family, I do believe that there is sufficient overlap between these various critical realisms, in addition to their differences. All critical realists seem to endorse the first three core stances and all critical realists position themselves against naïve realism.

Such an approach to critical realism, where we recognise their differences, but we do consider them as a family, is not unique to critical realism. Examples here are plentiful. In philosophy of science, for instance, scientific realism is a good example. With very broad strokes, scientific realism is the view that both observable and unobservable objects that our scientific theories postulate exist mind-independently. But, for some, scientific realism as it stands is not yet a position that is precise enough and they have found it necessary to qualify their views. For example, what does it mean that scientific theories are considered 'approximately true'? Or, what parts of the scientific theory should we deem worthy of our epistemological commitments? A wide spectrum of variations has been suggested that all fall under the umbrella of 'scientific realism'. For example, entity realism claims that we have good reasons to believe in the existence of the entities postulated by our scientific theories, but we should be generally sceptical about the truth of scientific theories as such. It is not so much the truth of scientific theories that warrants our beliefs in *x*, where *x* means an unobservable entity, but rather our interaction with *x*. However, some scientific realists take a structural realist approach, according to which we should be realists about the structures of our best scientific theories, rather than our descriptions. As such, there is a wide variety of positions that all fall under 'scientific realism', and, I would argue that we should view critical realism in similar terms: as a family of critical realisms that resemble one another by committing – despite their differences – to a particular set of philosophical and methodological stances.

With the notion of 'family resemblance' in mind, let us unpack each of the four philosophical stances of critical realism in the following chapters, starting with the metaphysical commitment of critical realism.

CHAPTER 2

THE MIND-INDEPENDENCE OF WHAT?
Critical Realism and its Metaphysical Stance

In the previous chapter, we introduced the notion of 'family resemblance' as an appropriate metaphor for understanding the relationships of those endorsing critical realism in science-theology scholarship, and, in the final section, we provided a taxonomy of critical realism. This chapter will be concerned with the first key stance of critical realism, namely its metaphysical commitments. After providing a number of general remarks regarding the metaphysical commitments and charting the context in which critical realism should be situated, i.e. debates concerning naïve or non-naïve realism (Section 2.1), this chapter sets out to explore the metaphysical stance of critical realism. Critical realism makes a commitment to a realist position, whilst simultaneously recognising the pivotal role of conceptual frameworks in engaging with reality. However, this form of realism raises the challenge how to explain the relationship between the physical world and the human mind. Two solutions will be discussed that deal with this issue, before discussing the metaphysical stance of critical realism. First, a rather extreme solution has been provided by Berkeley (Section 2.2), and from the outset critical realists have rejected Berkeleyan idealism. Second, Kant has provided a subtler solution, which recognises the important role of the human mind, whilst maintaining the existence of an objective, albeit unknowable, mind-independent reality (Section 2.3). Yet, Kant's account seems to be inadequate for capturing the kind of realism that critical realists want to defend, and they are particularly sceptical about Kant's *phenomena-noumena* distinction (Section 2.4). Critical realists tend to maintain that science and theology reveal things as they are in themselves, whilst recognising the important role of the human mind in constructing images to understand nature. For critical realists, reality exists independently of our perspectives and schemes, but our knowledge claims are always relative to our conceptual schemes (Section 2.5).

2.1 Metaphysical Realism and the Problem of Knowing the External World

Issues concerning metaphysical realism are settled in a rather straightforward way in the science and theology field. Already in the initially more comprehensive elaboration of the critical realist position in Barbour's *Issues in Science and Religion*, there was an explicit commitment to metaphysical realism and a lucid refutation of any constructivist or instrumentalist approaches. In this work, Barbour argues, for example, that "our primitive awareness is of being in a world, not of constructing one" (Barbour, 1966b: 171). In general, critical realism endorses a conjunction of two generic claims regarding the nature of reality. On the one hand, critical realists hold an existence claim, arguing that the objects in the world indeed exist and do inhabit the world. There is a relationship – critical realists argue – between, on the one hand, theories, statements and models, and, on the other hand, reality and its furniture. Knowledge claims about physical reality, for example, demand that reality contains the objects to which these claims refer. If physical reality did not contain these objects, the knowledge claim would be false. For critical realists, to say that *x* exists is then to make a commitment that there is such a thing as *x*.[1]

Yet, critical realists maintain that it is not sufficient to merely assert that *x* exists. Critical realism proceeds also to address the question of whether the existence of a certain entity or reality in general depends ontologically on mental states. For critical realists, a strong ontological dependency of natural entities on the human mind is implausible. Our conceptualisations do not 'shape' or 'mould' or 'construe' reality. Rather than, say, being a projection of a social structure created by human minds, reality (both the physical and the divine) is 'out there', as a given. Hence, according to critical realism, scientists and theologians discover and map out this mind-independent reality, rather than constructing it mentally. As Polkinghorne puts it, the scientific endeavour should be considered as "exploring a physical world whose nature 'out there' is independent of human constructions" (Polkinghorne, 2009: 25).

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[1] For instance, to say that 'John exists' is to make the realist commitment that there is a person named John. Considered by many as the default position, the notion of 'ontological commitment' has often be traced to the work of W.H. Quine and has dominated the ontological debates in analytic philosophy. According to Quine, "a theory is committed to those and only those entities to which the bound variables of the theory must be capable of referring in order that the affirmations made in the theory be true" (Quine, 1948: 33). For example, the statement '$\exists x$ John(x)', where $\exists$ is an existential quantifier that symbolises the statement 'there exists' and 'John (x)' is the bound variable, is committed to the existence of John. The bound variable x must include John in order for the statement to be true and thus the statement seems to involve a realist commitment to the existence of John.

But let us probe a bit deeper into the metaphysical considerations underpinning critical realism, which gravitate around the debate regarding the nature and quality of our knowledge of external reality. From the outset, critical realists have positioned themselves against those who argue that the human mind is able to uncover the hidden structures and mechanisms of the natural world without the mediation of conceptual frameworks through which the observer perceives the physical object, a position they often disparage as 'naïve realism'.[2] Critical realists construe the naïve realist school of thought as believing that perception of mind-independent objects emerges out of our ordinary life and is directed to reality-in-itself. For naïve realists, there is no such thing as a mediating conceptual framework involved in our acts of acquiring knowledge about reality. Experiencing a table and four chairs, according to naïve realism, implies that we come to know that the observation-statement 'there is a table and four chairs here' is true. Or, as Soskice puts it in the context of theology: "a theological naïve realist would assume there to be no difficulty in describing God by the same terms we use of observables; that God simply and truly gets 'angry', 'harden his heart', or is the 'king of heaven'" (Soskice, 1985: 119). Hence, for a naïve realist, sense-experience is the source of *immediate* knowledge, which is then formulated in our observation-statements. Theories and models are considered to be ready-made, reproducing as it were in an unmediated way reality-in-itself.

However, this, according to critical realists, leads to a rather naïve understanding of reality, as it overlooks the gap between our experiences of reality and the statements we formulate on the basis of those experiences. For example, we need to have the concepts of tables and chairs in order to formulate such an observation-statement, and, thus, scientists – and theologians – do not simply perceive raw data and materials in front of them.[3] As Polkinghorne puts it, "intelligibility requires the adoption of a prior interpretative point of view in the effort to make sense of what is going on", and for

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[2] Naïve realists are often considered to be 'naïve' due to the lack of philosophical sophistication, whilst adherents of critical realism praise their view for its sophistication (see Southgate and Poole, 2011: 16). Other terms used to categorise this branch of realism are George Lakoff's 'basic realism' (Lakoff, 1987: 158) or Putnam's, following William James, 'natural realism of the common man' (Putnam, 1999: 15). Polkinghorne coins the term 'naïve objectivity' to describe this branch of realism, see Polkinghorne, 1996a: 14; *idem*, 2011: 10. Interestingly, none of the critical realists give any examples of who those 'naïve' realists are. Soskice also discusses naïve realism, where she summarises Mary Hesse's account of naïve realism. For Soskice, see Soskice, 1985: 118-119. For Hesse, see Hesse, 1974: 285-290. See also Gilkey, 1993: 50-54 for a more in-depth exploration, with examples, into naïve realism from a critical realist standpoint.

[3] See Polkinghorne, 1996a: 15.

the naïve realists, such a prior interpretive framework is not involved in the acquisition of knowledge (Polkinghorne, 1996a: 15). Seeing tables and chairs *as* tables and chairs requires that the observer possesses the necessary concepts and words in order to formulate his or her observation-statement; things become even muddier, critical realists maintain, when we take unobservable entities into consideration, where the strangeness or counter-intuitiveness of the unobservable phenomena often opposes the assumptions of scientists.[4]

The gap, therefore, between our experiences and our observation-statements is filled by our concepts and language, which leads to a triadic relation between the perceiver, the perceived physical object, and the conceptual framework. In contrast to naïve realism, critical realists maintain that all acts of acquiring knowledge and the resulting knowledge claims are mediated through our conceptual frameworks. Southgate and Poole, for example, argue that "scientific views always depend on particular preconceptions about the world and particular ways of measuring it; they are moreover in a continual stage of change, and in some cases undergo radical correction – these considerations are enough to rule out naïve realism" (Southgate and Poole, 2011: 16). We can only understand reality through the cognitive apparatus of the mind, i.e. the tools of understanding. There is, thus, a pivotal role for the human mind in engaging with reality.

However, the critical realist's rejection of naïve realism raises the question of how then the physical world-in-itself (to borrow Kantian terminology), relates to our conceptual frameworks. There are at the least two ways to address this question, which will form the backdrop to this chapter: reality is either a mere mental/ideal construct, or it is the 'object of experience' of an independently operating world 'out there'.[5] The first option – reality as a mental construct, with George Berkeley as its spokesperson – seems to be the obvious starting point in exploring the critical realists' view on the relationship between mind and matter as it has been widely discussed and criticised in the critical realist literature.[6] As mentioned above, critical realists do want to maintain the mind-independent existence of reality and, thus, they consider Berkeley's solution to be inadequate and problematic. Yet, their strong emphasis on the mediated nature

[4] See Peacocke, 1984: 15; Polkinghorne, 1996a: 14. Peters and Peterson present a similar argument to Peacocke, see Peters and Peterson, 2013: 193.
[5] The explorations of this chapter into the various answers and their oppositions are far from exhaustive as there are numerous subtle differences amongst both traditions.
[6] See Barbour, 1966b: 166-168; Polkinghorne, 2006a: 85; Southgate and Poole, 2011: 16.

of knowledge seems to put critical realists on a rather slippery slope towards some form of idealism, despite their endorsement of a mind-independent reality.

One way to ward off strong idealism is to endorse the second, Kantian-in-spirit option – namely that where known reality is the object of experience of an independently operating world out there - as the most viable. Linking critical realism to Kantian philosophy is not a very novel idea, because the apparent similarities between critical realism and Kant have also been noted by others in the science-theology exchange. In exploring the historical roots of critical realism, for example, van Kooten Niekerk and Losch identify similarities between Kant's philosophy and critical realism.[7] As Losch puts it, "*critical realism is a type of realism defining the term in Kant's sense as related to the question of the existence of the tempospatial world*" (Losch, 2009: 85).[8] However, despite the historical connection between Kant and critical realism, Losch maintains that Barbour, Peacocke, Polkinghorne and the like should not be considered as Kantians. As a matter of fact, Losch points out that Barbour, for example, is critical about the resulting idealism that stems from Kant's philosophy. A similar sentiment can be found in Pat Bennett's contribution to *God and the Scientist: Exploring the Work of John Polkinghorne*. According to Bennett, "its [i.e. critical realism's] recent usage by the scientist-theologians essentially delineates an acceptance of Kantian empiricism coupled with a rejection of Kant's transcendental idealism" (Bennett, 2012: 177). Despite the fact that it is unfortunate that Bennett does not discuss the seemingly Kantian roots of critical realism in any detail, there is at least a wider acknowledgement in the science and theology field that critical realism appears to have some (historical) connection with Kantianism.

Nevertheless, critical realists are not full-blown Kantians either; a similar argument can be found in Losch and Bennett's accounts. Whilst critical realism agrees with Kant that knowledge is indeed scheme-dependent, influenced by sociological, psychological and historical factors, critical realists strongly oppose the Kantian distinction between the *noumena* and *phenomena*, denying the inaccessibility and unknowability of the *noumena*, and maintaining that scientists and theologians engage with reality *directly*, without a veil. The unknowability of the things-in-themselves is rejected. For this reason, the rest of this chapter sets out to clarify the very nuanced

[7] See van Kooten Niekerk, 1998: 51.
[8] Italics: Losch.

and multi-faceted metaphysical stance amongst critical realists regarding the relationship between mind and the external reality.

2.2 Reality as Mental Construct: Ontological Idealism

As mentioned above, critical realism assumes a triadic relationship between the perceiver, the physical object, and the conceptual framework mediating between the objects and the human mind. Rather than giving an equal share to each of the elements of the triadic relationship, as critical realism suggests, one way of defining this relationship is by giving ontological primacy to the mental, considering the perceiver's mind as the ultimate foundation of reality. Often perceived as the opposing school of thought to realism, ontological idealism aims to establish this asymmetrical relationship.

According to ontological idealism, all of reality is ontologically dependent on the human mind, and its mental states. The best-known defender of this idealist tradition was the eminent British eighteenth-century philosopher George Berkeley, who argued that the human mind is the ultimate foundation of all that exists. Important for understanding Berkeley is his rejection of the distinction between primary and secondary qualities. In the early modern period, primary qualities, such as being in space, were supposed to be mind-independent, whilst secondary properties, such as taste and colour, were considered to be relative to perception. For Berkeley, however, this primary/secondary distinction is false as there are no objects existing independently of human minds. It is, according to Berkeley, impossible to know whether primary qualities are actually objective, existing independently of human minds, due to the fact that we only have access to the primary qualities through our perceptual abilities. He grounds this argument on three premises:

> Premise (1): Objects are collections of qualities (e.g. colour, shape, solidity);
> Premise (2): Qualities are perceived through senses and leave fainted copies in the human mind (e.g. touch, smell, sight);
> Premise (3): Qualities exist only in the mind.

As a consequence, the assumed objective primary qualities are as relative as secondary ones, causing Berkeley to conclude that the assumed primary qualities are actually secondary. In his own words, "[f]or as to what is said of the absolute [i.e. mind-

independent] existence of unthinking things without any relation to their being perceived, that seems perfectly unintelligible. Their *esse* is *percipi*, nor is it possible they should have any existence, out of the minds or thinking things which perceive them" (Berkeley, 1949: §3). The cardinal principle *esse* is *percipi* – to be is to be perceived – encapsulates Berkeley's idealism. All properties, including the primary ones, only exist when perceived by the unperceived human mind and, as a consequence, all that exists is mental in nature.[9]

2.2.1 Rejecting Ontological Idealism: A Critical Realist Response

From the outset, critical realism has rejected the strong views of ontological idealism by endorsing the mind-independent existence of the physical world and its furniture. Polkinghorne, for example, explicitly rejects ontological idealism. As he puts it, "I refuse to join the idealists in assigning an ontological priority to the mental over the material" (Polkinghorne, 2006a: 85). For Polkinghorne and critical realism in general, there is indeed a material world out there and we can investigate this mind-independent world.

Since van Kooten Niekerk has provided the most elaborative rejection of Berkeley's ontological idealism and his criticism seems to be in accord with the inner circle of the critical realist family, i.e. Barbour, Peacocke, and Polkinghorne, his critique will be used as an example of the critical realist rejection of the ontological idealist stance.[10] In his contribution to *Rethinking Theology and Science*, Kees van Kooten Niekerk examines and endorses a critical realist approach and strongly opposes Berkeley's full-blown ontological idealism. Whilst affirming Berkeley's idea that our only access to the physical world is through experience, van Kooten Niekerk refutes the Berkeleyan notion that our restricted access implies that the only existing world is a mental world. In order to justify his rejection of Berkeleyan idealism, van Kooten Niekerk elaborates upon three features of reality that justify the existence of a physical world 'out there'.[11]

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[9] In the twentieth century, idealism came under strong attack in the Anglo-Saxon world. See Moore, 1903; *idem*, 1917; Russell, 1912.

[10] See Barbour, 1966b: 166-168; Polkinghorne, 2006a: 85; Southgate and Poole, 2011: 16. For an engaging overview of Polkinghorne's rejection of Berkeley, see also Ward, 2012: 127-137.

[11] In developing these three features, van Kooten Niekerk relies upon Bertrand Russell's defense of realism in his *The Problems of Philosophy*. See Russell, 1912: 7-12.

According to the first feature, the physical world does not conform to one's intentions. Time and again we are confronted with events that undermine our personal expectations and desires. Van Kooten Niekerk gives a vivid illustration of this feature:

> I am on my way to work. When I arrive at the railway station I see my train just leaving. I have to wait a quarter of an hour for the next train. I enter my working place in a mood of irritation. Therefore, I don't notice the glass door, which normally stands open. I hit my head and I am plagued by a bad headache the rest of the day (van Kooten Niekerk, 1998: 54).

Or, as Polkinghorne puts it:

> Defence of realism in science depends partly upon recognising the unexpected character often stubbornly displayed by nature. Far from its behaving like epistemological clay in our pattern-seeking hands, capable of being moulded into any pleasing shape that takes the fancy, the physical world frequently proves highly surprising, resisting our expectations and forcing us to extend, in unanticipated ways, the range of our intellectual understanding (Polkinghorne, 2006b: 4).

The most plausible explanation for this, claim van Kooten Niekerk and Polkinghorne, is to endorse a mind-independent world with trains and glass doors – in van Kooten Niekerk's case – or the stubbornness of the physical world in general – in Polkinghorne's case – that behave contrary to our expectations of them.

Van Kooten Niekerk grounds the second feature in the notion of dualism, according to which the physical and the mental are real and cannot can be incorporated into each other. This dualistic dichotomy between the mental and the physical in van Kooten Niekerk's elaboration is exemplified by two experiences, which cannot be explained adequately on the basis of Berkeleyan Idealism. On the one hand, the human body seems to be part of the physical world. It is a physical object in space and time amongst numerous other physical objects. Yet, mental states are closely tied to our bodies, claims van Kooten Niekerk, because "I do not only experience my body as a part of the world but also from within (e.g., in feelings of warmth and pain)" (van Kooten Niekerk, 1998: 54). Similar to the conclusion of the first feature of the physical

world, van Kooten Niekerk then infers that the confrontation of our mind with our body can only be explained by the assertion that "my mind through my body is situated in a physical world that exists independently of it" (van Kooten Niekerk, 1998: 54).

The third and final feature is that the furniture of the physical world does not merely include other physical objects: it is also populated with entities that are very similar to oneself. Our mind is one amongst many other minds and 'foreign' physical objects, and their existence does not depend on us perceiving them. Van Kooten Niekerk, thus, believes that Berkeleyan Idealism is unable to explain the confrontation with other human beings that have certain knowledge that was initially unknown to the human mind.

Against Berkeley, then, van Kooten Niekerk concludes that it is difficult to explain reality as being dependent on the human mind. He believes that "in normal sense experience I meet a real physical world", rather than a reality that is determined by, or composed of, the human mind; a position shared amongst critical realists (van Kooten Niekerk, 1998: 55). With van Kooten Niekerk as their spokesperson against Berkeley's idealism, critical realists reject the ontological dependence claim, i.e. that *x* is ontologically dependent on *S* if *x* could not exist without S existing for reasons given above. Objects, such as tables, chairs, stones and human beings, will not cease to exist if I cease to exist.[12] As a result, full-blown ontological idealism is rejected.

Whilst the above provides an example of how critical realists tend to avoid full-blown ontological idealism, the challenge still remains for critical realism to explain how the mind-independent physical reality relates to our conceptual frameworks used to explore and understand that reality. Due to the conditioned nature of our knowledge, are we warranted in believing in the existence of a mind-independent physical world? A very influential solution to the critical realist challenge has been provided by Immanuel Kant, who has suggested the renowned distinction between the phenomenal realm of 'things-as-they-appear-to-us' and the noumenal realm of 'things-in-themselves' as a means to solve this epistemological problem. In the next section, I therefore turn to a more nuanced view of the relationship between mind and reality, by discussing the critical philosophy of Kant and laying out more recent interpretations of Kantianism in conceptual relativism, before returning to how I see the critical realist

[12] Whilst this is true of, for example, external objects, there are of course things that do depend on my existence. Examples here are plentiful, such as dreams, hallucinations and pain.

stance as an interplay between the conceptual relativeness of our knowledge claims and the conceptual scheme-independent reality in sections 2.4 and 2.5.

2.3 Mental Appearance of a Mind-Independent Reality: Epistemological Idealism

Whilst Berkeleyan idealism argued for the ontological or existential dependency of objects on the human mind, others have pointed out the active role of the human mind in understanding reality, whilst reality and the objects it contains exist mind-independently. Contrary to Berkeleyan idealism, these philosophers maintain that reality does not originate from the human mind, and, yet, the knower is actively involved in the acquisition of knowledge, making at least part of reality mind-independent. There is an assumed tension, according to these philosophers, between the mind-independent existence of reality and our attempts to acquire knowledge of this reality, which led Kant, for example, to make a distinction between the things-in-themselves (*noumena*) and the things-as-they-appear-to-us (*phenomena*). In contemporary metaphysical debates, metaphysical realism is contrasted more often with an opposition that stems from the Kantian tradition, rather than Berkeleyan idealism.[13] We will discuss the *noumena-phenomena* distinction in more detail down below.

In the following sections, two Kantian views of the relationship between the mind-independence of reality and the conceptualisations of reality by the human mind will be explored. First, Kant's solution to the aforementioned epistemological problem will be explored in more detail, because Kant's answer has been considered by many as a turning point in the history of philosophy. Second, a more recent example will be explored that has been deeply inspired by Kant, namely conceptual relativism, although Kant himself was no conceptual relativist.[14] Discussing Kant and recent interpreters of Kant's work, therefore, will provide the backdrop against which we can explore and discuss the metaphysical stance of critical realism in section 2.4 and 2.5.

2.3.1 Mind-Independence and the Kantian Tradition

From the outset, Kant's epistemological idealism has been conceived as being entangled with the ontological idealism of Berkeley, which is often grounded on the mistaken view, Ameriks points out, that Kant, like Berkeley, equated existence with

[13] See Alston, 2002: 1.
[14] See Taylor, 2011: 161.

representation.[15] In order to distance himself from the rather radical views of ontological idealism, Kant sets out in the *Refutation of Idealism* to prove that "we have experience and not merely imagination of outer things, which cannot be accomplished unless one can prove that even our inner experience, undoubted by Descartes, is possible only under the presupposition of outer experience" (Kant, 2009: B275). Contrary to ontological idealism, Kant maintains that the existence of something permanent outside the human mind is a necessary condition for being aware of oneself as existing.[16] For example, we could be aware of certain changes in objects, but the notion of change assumes a temporal order from the pre-change state to the current state. If ontological idealism is true, then how could we be able to determine the temporal order of the pre-change state to the current state? This, Kant maintains, perceiving or experiencing change requires a reference point, i.e. something permanent that must exist outside the human mind. Experiencing other objects is for Kant thus only possible if these objects exist outside the epistemic subject, and thus reality and its objects cannot be mental in character.

Yet the mere mind-independent existence of reality and the objects it contains is not sufficient for Kant to explain how it is possible for the human mind to grasp an intelligible world. Before Kant, there were two main traditions that provided an explanation for this. On the one hand, rationalists, such as Descartes and Leibniz, argued that knowledge of the external world originates a priori in clear and distinct ideas that the mind innately possesses. On the other hand, empiricists consider the senses as the privileged way to acquire knowledge about the external world, rather than basing knowledge on the speculative capacities of reason.[17] Contrary to

[15] For a detailed overview of the conceived entanglement between Berkeley and Kant, see Ameriks, 2006: 67-88.

[16] See Kant, 2009: B275. Underpinning Kant's rejection of ontological idealism is an issue that is often traced back to Descartes, which Kant describes as "the theory that declares the existence of objects in space outside us to be either merely doubtful and indemonstrable, or even false and impossible" (Kant, 2009: B274). See also Dicker, 2008: 82 for a helpful reconstruction of Kant's argument against Berkeley.

[17] A prime example for Kant against empiricism is the idea of space. Empiricists maintain that the observer starts with the perceiving of the spatial relationship between objects, from which the observer constructs the idea of space. Kant, however, points out that in order to have a perception of objects as being in different places, the observer must represent objects as being *in* space. Yet, for this to be possible, the human mind needs to have concept of space as an a priori intuition, prior to any possible experience of natural phenomena as being in space. In other words, the observing of objects as being in different places presupposes a prior understanding of being *in* space. See also Kant, 2009: A22-30 / B36-45.

rationalism, empiricists consider the mind to be a *tabula rasa*, denying the existence of innate ideas.

Going beyond rationalism and empiricism, it was Kant who intended to provide a middle ground between rationalism and empiricism.[18] Contrary to both traditions, Kant held that there are certain concepts that one could not know by regarding either reason or sense experience as the only ground for knowledge. In Kant's synthesis of rationalism and empiricism, both experience and reason contribute equally to knowledge. He maintains that

> neither of these properties [i.e. senses and understanding] is to be preferred to the other. Without sensibility no object would be given to us, and without understanding none would be thought. Thoughts without content are empty, intuitions without concepts are blind. It is thus just as necessary to make the mind's concepts sensible (i.e. to add an object to them in intuition) as it is to make its intuitions understandable (i.e. to bring them under concepts). (Kant, 2009: A51 / B75).

Knowledge, for Kant, can only arise through the joint work of both the faculty of sensibility and the faculty of understanding.

In the first part of the *Critique of Pure Reason*, the so-called Transcendental Aesthetic, Kant sets out to explain how human knowledge begins with sensibility as when we intuit objects as being in space and time, where space and time are for Kant a priori forms intuitions delivered by the faculty of sensibility. However, sensibility needs the faculty of understanding to produce objects of possible experience. It is, according to Kant, the structuring ability of the faculty of understanding that makes experience of nature ultimately possible for us. Rather than concurring with the empiricist idea that physical objects are passively given to the human mind as, say, a list of things, Kant argued that understanding and reason are both actively involved in

[18] Since space does not allow me to delve into the subtle differences as well as the complexities of the relationship between Kant, rationalism and empiricism, this rather general exposition of the different views on the relationship between the human mind and the external reality is far from exhaustive. I concur with Russell's inference that Kant's view on this relationship is "very difficult, and is differently understood by different philosophers. We can, therefore, only give the merest outline of it, and even that will be thought misleading by many exponents of Kant's system" (Russell, 1912: 48). As with nearly all themes in Kantian scholarship, there is a vast amount of literature on this. See Guyer, 1987; *idem*, 2005; Ameriks, 2012.

determining how one experiences the world and in structuring these experiences. As a consequence, pivotal for Kant then is that the mind's ability to systematically structure representations of reality comes before experience, which led Kant to conclude – contrary to Locke – that the mind is not a *tabula rasa*. If it is indeed the case that the categories of understanding, i.e. quantity, quality, relation, and modality, are prior to experience, then these categories and concepts are a priori too.[19] Certain notions, such as time and space, are considered to be inborn. Kant's argument for the a priori nature of, say, space is as follows: "one can never represent that there is no space, though one can very well think that there are no objects to be encountered in it" (Kant, 2009: A24 / B38). Therefore, space, as well as time, is regarded by Kant as the conditions of the possibility, rather than the result, of appearances, for a representation of space is already required in order to experience an external object. Furthermore, understanding does not only come before experience, it also shapes the experience we have. In the process of systematically structuring the spatiotemporal manifold, understanding provides the categories that, for example, allow us to think of spatiotemporal appearances as being causally connected; e.g. causality as a principle of the

[19] The possibility of the mind's categories and concepts as being *a priori*, synthetic *a priori* to be more precise, became a major concern of his *Critique of Pure Reason*. In Kant's terminology, there is a distinction between 'analytic' and 'synthetic' judgments or assertions. An analytic judgment is an assertion of a predicate that is already included as part of its meaning, i.e. "predicate *B* belongs to the subject *A* as something that is (covertly) contained in this concept *A*" (Kant, 2009: A6 / B10). These judgments are considered to be analytic, because predicate *B* can be found by analysing the meaning of subject *A*. 'All bodies are extended' is an example that Kant provides to illustrate an analytic judgment (Kant, 2009: A7 / B11). In thinking of a body, I simultaneously think about something that occupies space. The notion of extension is contained in the notion of body. Synthetic judgments, on the other hand, synthesise concept *A* with concept *B* that is outside concept *A*. This kind of judgment has an ampliative or extending nature in that it adds to concept *A* a predicate that was not contained in this concept. For example, the assertion 'the front cover of my copy of Kant's *Critique of Pure Reason* has a portrait of Kant' is synthetic, because the predicate 'portrait of Kant' is not part of the concept 'the front cover of Kant's *Critique of Pure Reason*'.

Whereas 'analytic' and 'synthetic' refer to different kinds of assertions, '*a priori*' and '*a posteriori*' refer to different kinds of knowledge. *A priori* knowledge are cognitions that are independent of all experience. Prime examples of this kind of knowledge are mathematical statements, because these statements are known to be valid independently of any sense experience. For Kant, analytic judgments are all known *a priori*, because these judgments cannot be disconfirmed by sense experiences. *A posteriori* cognitions, on the other hand, have their source in experience. I can only determine, for example, as to whether the front cover of my copy of Kant's *Critique of Pure Reason* actually has a portrait of Kant by an appeal to sense experiences, i.e. by observing the particular copy. Even though most synthetic judgments are known *a posteriori*, the real problem of pure reason, according to Kant, is the question as to whether "synthetic judgments [are] *a priori* possible" (Kant, 2009: B19). For Kant, it is indeed the case that the notion of *a priori* is not only limited to analytic judgments, but some synthetic judgments are also known *a priori*. All fundamental principles of philosophy and the contents of mathematics are for example known synthetic *a priori*. For example, the mathematical statement '1 + 2 = 3' is not based on experience, but it is also not analytic. The concept of '3' is neither contained in the concepts of '1', nor '2', nor '+'. Therefore, in addition to being *a priori*, this statement is, according to Kant also synthetic.

understanding under the category of quality allows us to think of the appearance of the stone being thrown and the appearance of the window smashing as being related according to cause-effect. However, against rationalism, Kant maintains that the understanding itself is devoid of any content, because it provides the mere formal structuring to the spatiotemporal manifold that the faculty of sensibility puts in place. It is, therefore, the interaction between both the faculty of sensibility and the faculty of understanding that leads to knowledge of nature.

Thus, rather than knowing the object itself, all the human mind is able to know are conceptualised appearances, or what Kant calls '*phenomena*'. For Kant, "our representation of things as they are given to us does not conform to these things as they are in themselves but rather that these objects as appearances conform to our way of representing" (Kant, 2009: Bxx). This led Kant to concede a distinction between things-in-themselves (*noumena*) and things as they appear to us (*phenomena*). According to the phenomenal world, our concepts only acquire knowledge through their "being related merely to appearances, i.e. objects of a possible experience", whereas any endeavour to yield knowledge by applying our concepts "to things in general and in themselves" is bound to lead human reason into what Kant calls the antinomies of reason, i.e. some unsolvable metaphysical dilemmas, such as the beginning of the world in space and time and as to whether the world is infinite in space and time, because we cannot have any knowledge of the *noumena* (Kant, 2009: §A238-9 / B298).[20] For Kant, therefore, the thing-in-itself does not depend on human cognition for either its existence or its nature. Appearances, on the other hand, exist

[20] Kantian scholars disagree widely how to interpret the relationship between *noumena* and *phenomena*. Two readings have been particularly influential. Traditionally, on the one hand, Kant has been taken to imply the existence of two classes of objects, i.e. the world of appearances and the world of things-in-themselves. On this interpretation, the objects of the *noumena* are ontologically distinct from their appearances. A recent proponent of this 'two object-interpretation' can be found in the work of Paul Guyer. Even though he denies a strong ontological distinction between the *noumena* and *phenomena*, Guyer does argue for a weaker interpretation of the traditional reading of Kant by claiming that "Kant does not need to postulate a second set of objects beyond the ones we ordinarily refer to in order to strip space and time from things as they are in themselves, and not just from our concepts of them, because the ontology from which he begins *already* includes two classes of objects, namely things like tables and chairs and our *representations* of them" (Guyer, 1987: 335).

Over and against this 'two object-interpretation', a number of scholars have argued that Kant advocates a conceptual division between the *noumena* and *phenomena*, instead of an ontological distinction. According to this reading, the *noumena* and *phenomena* are two ways of describing one and the same object rather than two sets of objects. Graham Bird, for instance, points out that phrases such as 'transcendental and empirical objects' or 'transcendental and empirical syntheses' should be "understood to refer not to two different kinds of entity, but instead to two different ways of thinking about one and the same thing" (Bird, 1962: 37).

A helpful overview of this discussion can be found in James van Cleve's *Problems from Kant* (van Cleve, 2003: 143-150).

only in being apprehended, and at least part their features owe their existence and nature to the way the human's cognitive apparatus is programmed to conceptually structure them.

2.3.2 A Recent Interpretation of Kant's Solution: Conceptual Relativism

Since Kant's introduction of the distinction between the *noumena* and *phenomena*, the human mind is not merely understood as a passive faculty which perceives an objective reality 'out there'. Instead, as mentioned above, the human faculties become part of the creation of reality by actively contributing to the shaping of it. However, whilst Kant maintained the existence of an objective reality, i.e. the *noumena*, others have rejected the notion of such an objective reality. Inspired by Kant, Nelson Goodman, Richard Rorty, and Hilary Putnam have in different ways advocated positions that can be regarded as close enough to versions of conceptual relativism. [21]

In addition to being a contemporary and influential expression of Kantianism in the twentieth-century, there is another reason for discussing conceptual relativism here. Critical realists rely – on several occasions – on the work of Putnam in elaborating their metaphysical, epistemological, and semantic considerations. Already in his earlier work on science and theology, Peacocke considers Putnam to be a helpful source for exploring his own realist commitments. As Peacocke puts it, "this kind of realism [critical realism – or as Peacocke puts it 'sceptical' or 'qualified' realism] has been well, and approvingly, characterized thus by H. W. Putnam" (Peacocke, 1979: 21). A similar sentiment to the work of Putnam can also be found in Soskice's *Metaphors and Religious Language*, where she even considers Putnam to be a critical realist. In discussing the notion of accessibility, Soskice points out that "many critical realists like Mary Hesse (and Hilary Putnam in recent writings) would exercise more caution than does Bhaskar in discussing the ultimate objects of scientific study" (Soskice, 1985: 123). Hence, critical realists consider Putnam as a friend, rather than

[21] For Goodman, see e.g. Goodman, 1978. For an engaging collection of articles on Goodman's position, see also McCormick, 1996. For Putnam, see e.g. Putnam, 1981; *idem*, 1990. It is important to note that Putnam never called himself a conceptual relativist and, in particular in his *Reason, Truth and History*, Putnam has developed strong criticisms against rather strong views of relativism. Some, however, have read Putnam's internal realism as affectively a form of conceptual relativism. See Boghossian, 2006, 35-37. For the sake of clarity, I consider Putnam here as providing an account that can be regarded as close enough to versions of conceptual relativism, whilst also recognising the problems that stem from this classification.

a foe, which makes the discussion of conceptual relativism relevant for understanding critical realism.

What then do conceptual relativists believe? Being concerned with the relationship between language, mind and the world, conceptual relativists argue that

> whatever we say of the world is permeated throughout with concepts of our own making. Even such *prima facie* transparently simple notions as that of an individual turn out to depend on conceptual assumptions dealing with different possible state of affairs. As far as our thinking is concerned, reality cannot be in principle wholly disentangled from our concepts. A *Ding an sich*, which could be described or even as much as individuated without relying on some particular framework, is bound to remain an illusion (Hintikka, 1972: 457).

In other words, reality and the objects it contains, conceptual relativists maintain, are considered to be scheme-relative and do not present themselves already-structured or ready-made. Since all knowledge is scheme-relative and there exists a plurality of ways to categorise and conceptualise reality, there is no preferred or superior conceptual framework.[22] For such a preference or superiority would imply that there exists something outside the conceptual frameworks to which these schemes could be compared and judged. Yet, due to the fact that all thinking takes places *within* a conceptual framework, there is no neutral ground or scheme that could be used for comparing these various frameworks. Hence, two or more incommensurable conceptual frameworks may be equally valid, and there seems to be no way of telling which scheme is more adequate compared to other schemes, due to the scheme-conditioned nature of all knowledge.

Probably the best-known example of conceptual relativism is Goodman's *irrealism*. According to irrealism, minds are literally making up worlds. Underpinning Goodman's view is the assumption that one single world cannot accommodate conflicting, yet true, statements about that world. For Goodman then, each conflicting statement bears a literal truth about *a* world, but not the *same* world, as each conflicting world needs to be distinguished from the other. As a consequence, there is thus no

[22] A similar rejection of the notion of 'superior' or 'privileged' can be found in Soskice's account of critical realism, but then with a realist blend. See Soskice, 1985: 131; 136.

such thing as one 'right' world. Instead, there are numerous worlds out there, each corresponding to a correct description of the way that particular world is.

In developing his *internal realism*, Putnam, on the other hand, disagrees with Goodman regarding a literal interpretation of the notion of world-making, and, yet, the human mind does not encounter a ready-made world either. In exploring a middle ground between metaphysical realism and Goodman's irrealism, Putnam maintains that

> a sign that is actually employed in a particular way by a particular community of users can correspond to particular objects *within the conceptual scheme of those users*. 'Objects' do not exist independently of conceptual schemes. *We* cut up the world into objects when we introduce one or another scheme of description" (Putnam, 1981: 52).[23]

For Putnam, then, the 'way the world is' is determined by, and is relative to, the conceptual framework one uses.

Underpinning Putnam's conceptual relativism is the core belief that there could be more than one 'right' way of describing the way the world is. A helpful and oft-used example is provided by Putnam to illustrate this.[24] Consider two individuals, whom Putnam calls Carnap and the Polish Logician, who are confronted with three entities, x1, x2, and x3. A rather obvious answer to the question as to how many objects are there in this world is to say that there are three independent objects. With a reference to the calculus of wholes and parts of Lezniewski, the Polish Logician, however, rejects this self-evident answer. Rather than three entities, the Polish Logician maintains that there are actually four other entities, pointing out that for every two entities there is also an entity, which is their sum.[25] This illustration leads Putnam to conclude that there is no neutral description, in that Carnap's description is true relative to his conceptual scheme, whilst the inference of the Polish Logician is also true relative to his conceptual scheme. For Putnam, the world does not force the subject into a certain way of describing it.[26]

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[23] Italics: Putnam.
[24] See Putnam, 1987: 17-19.
[25] I.e. x1, x2, x3, x1+x2, x2+x3, x1+x3, and x1+x2+x3.
[26] For a strong critique against Putnam's mereological example, see van Inwagen, 2002.

In discussing the challenge of how it is possible for the human mind to grasp an intelligible world, both Kant and the conceptual relativists emphasise the pivotal role of the human mind in engaging with and constructing reality. Human beings do not merely perceive raw data. On the contrary, the human mind is actively involved in structuring reality in such a way that it becomes possible to experience reality. As a result, all knowledge is relative to a conceptual framework, and reality-in-itself is either inaccessible or non-existent. Due to this state of affairs, both Kant and the conceptual relativists maintain that all the human mind is able to know are conceptualised appearances, i.e. *phenomena*. Yet, Kant and the conceptual relativists diverge on the issue of whether there is a mind-independent reality out there, i.e. *noumena*. For Kant, there have to be *noumena* in order to ward off full-blown ontological idealism. There has to be something permanent outside the human mind to being aware of, for example, change and ourselves. Conceptual relativists disagree here with Kant, because there is no neutral scheme or vantage point to which we could compare our conceptual schemes. Since conceptual relativism is a *relativist* position, reality is considered to be *relative* to our conceptual schemes; a stance that opposes Kant's views on these matters. In the next section, I clarify the aspects that critical realists share with Kantianism, in particular the conceptual relative nature of our knowledge claims, whilst also recognising a number of significant differences between critical realism and Kantian philosophy, such as the direct and immediate engagement of our knowledge claims with reality-in-itself.

2.4 Critical Realism and its Metaphysical Commitments

Key to critical realism in its rejection of naïve realism is the notion of mediated knowledge, according to which the epistemic subject is always involved in the process of acquiring knowledge. Perception is never direct and, as a result, our epistemic constructs neither mirror reality nor describe the natural world exhaustively. Neither scientists nor theologians perceive raw data nor provide an objective record that simply mirrors how things are. However, the critical realist endorsement of non-naïve realism raises the question of how the physical world relates to the experienced world. In the previous two sections, we have explored two solutions that are discussed in the literature on critical realism. Section 2.2 was concerned with a rather extreme form of idealism, i.e. full-blown ontological idealism suggested by Berkeley. In section 2.3, we looked into the Kantian alternative, which recognises the fundamental role of the

human mind in engaging with reality. Each of these solutions is inadequate for critical realists. Against Berkeley's ontological idealism, critical realism is committed to a realist commitment about the mind-independent nature of reality, whilst – as will be discussed in this section – Kantianism seems to be inadequate for capturing the kind of realism that critical realists want to defend.

What, then, is the critical realist position on these matters? How do critical realists explain the relationship between the creative capabilities and involvement of the human mind and acquiring knowledge of the mind-independent reality? Barbour provides a helpful starting point for exploring the metaphysical stance of critical realism by claiming that "there is no simple access to the world as it exists in itself independently of being known, and mental constructs influence the interpretation of all experience" (Barbour, 1966b: 172). This metaphysical statement of Barbour's is important in at least two ways. First, against conceptual relativism, Barbour maintains that reality and its furniture exist independently of our perspectives, and, against Kant, that our concepts are concerned with reality-in-itself, immediately and directly. Second, in line with Kant, our knowledge claims about both physical and divine reality are *dependent* upon our schemes and conceptual frameworks.[27] As Ted Peters and Carl Peterson put it, the critical realist "approach to scientific [and theological] knowing includes two significant assumptions: that an objective physical world exists independently from human subjectivity and that human subjectivity constructs the picture of that world we hold in our minds" (Peters and Peterson, 2013: 186).

Barbour's conclusion here is very significant for the metaphysical stance of critical realism, as it provides the common thread amongst other critical realists in the family. Objects exist mind-independently, whilst our knowledge claims about these objects are influenced by psychological, historical, and sociological factors. As such, our knowledge claims are indeed scheme-relative, whilst the objects they refer to are scheme-independent. Scientists and theologians do not only discover and explore the

[27] This interplay between scheme-independent and scheme-dependent can also be found in Massimi's discussion of perspectival realism. See Massimi, 2016: 1. Perspectival realism holds that scientific models and theories correspond to parts of the world that are considered as 'objective', whilst scientific practice is deeply embedded in sociological and historical contexts that inform our perspectives on the physical reality and its furniture. Each mode of discourse represents a particular perspective – historically and culturally situated – on what there is. Massimi provides an apt characterisation of the promises of perspectival realism, according to which it should be understood as "a house with two mansions where realists can find shelter from relativism, while Kuhnians may find refugee against 'objectivist' realism" (Massimi, 2016: 1). For perspectival realism, see Giere, 2006; Massimi, 2012; *idem*, 2016.

mind-independent reality-in-itself, but they also create and construct frameworks for understanding that reality. Let us unpack this metaphysical commitment of critical realism in the following sections.

2.4.1 Unpacking Metaphysical Package 1: Scheme-Dependent Knowledge Claims

As discussed in the introductory remarks of this chapter, critical realism suggests that conceptual frameworks fill the gap between our experiences of reality and the statements we formulate on the basis of those experiences. There is no theory-neutral or theory-free perception. All perception is grounded on prior conceptual frameworks. As a result, acquiring knowledge is a theory-laden activity, critical realists maintain, because our knowledge claims are influenced by psychological, sociological, and historical factors. As Peters and Peterson put it, "as critical, it [critical realism] presupposes that human subjective analysis and construction contributes to what we deem to be knowledge. Our knowledge is more than mere perception; knowledge requires critical reflection on perception" (Peters and Peterson, 2013: 193). Our knowledge claims are, according to Peters and Peterson, fundamentally grounded on a nest of assumptions and the construction of theories are considered to be a product of the human imagination.[28]

Soskice provides some helpful insights into what critical realists actually mean with the scheme-relative nature of our knowledge claims. According to Soskice,

> He [a realist] agrees with the idealist in saying that science must involve creative model building, but parts from idealism in thinking that the mechanisms and structures so conceived need not be fictions but may sometimes be regarded as real. The realist, then, is committed not to any one particular account of the world or even to the possibility that a perfect account could be provided, but to the intelligibility of what is essentially an ontological question, 'What must the world be like for science to be possible?' (Soskice, 1985: 122).

Similar to the general trend amongst critical realists, Soskice points out here the scheme-independence of reality and its furniture, whilst recognising the conceptual-dependent nature of our knowledge claims, i.e. what Soskice calls 'creative model

[28] See Peters and Peterson, 2013: 194.

building'. For Soskice, knowledge is scheme-relative, because knowledge has a "social and context-relative nature" (Soskice, 1985: 131). She illustrates this claim by providing the example of whales being reclassified as 'non-fish', where she points out the scheme-relative nature of the factors used to classify whales as 'non-fish', rather than 'fish'. As Soskice puts it,

> we can conceive, however, that a reclassification might have taken place along different lines for different purposes, say, if our main focus of interest was animal locomotion. In that case, whales might be still classified as fish (perhaps as 'mammalian fish') whereas some fishy creatures with non-fishy movements would be classed as 'non-fish' (Soskice, 1985: 131).

The divisions we therefore make between, say, 'fish' and 'non-fish' are considered relative to the context of enquiry. As the example above demonstrates, we could have reclassified whales along different lines, in order for whales to remain classified as 'fish'. Due to the scheme-dependent nature of our knowledge claims, no scientific theory or theological model can be considered as being 'privileged' or of providing an 'exhaustive account' of reality.

A similar argument for the scheme-dependent nature of our knowledge claims can be found in van Kooten Niekerk's articles. According to van Kooten Niekerk, the "social dependence of our conceptualization confirms that perception does not give a precise reflection of the world", and, for van Kooten Niekerk, our conceptualisations are "individually and socially conditioned" (van Kooten Niekerk, 1998: 56-57). Underpinning this assertion is a distinction between sensation and perception, between *seeing that* and *seeing as*.[29] In the act of perception, according to van Kooten Niekerk, the perceiver perceives something *as x*, whilst sensations are in the domain of *seeing that*, confronting the observer with the object in front of him. Even if there are instances where sensations may well mirror the external world directly, this is not the case with perception. In perceiving an object, van Kooten Niekerk suggests, the perceiver is actively involved, structuring the sensations by means of prior knowledge

[29] This distinction between *seeing that* and *seeing as* is also pivotal for Norwood Hanson, who suggested the oft-quoted phrase 'all seeing is theory-laden'. See Hanson, 1958: 22-24. This will be explored in more detail in the Chapter 5 'The Humanisation of Science: The Scientist as Experiencing Being', see p. 144-147.

and concepts, which he illustrates with the example of perceiving a tree.[30] A layman might categorise the tree in front of him as a conifer or a Christmas tree, whilst the botanist perceives the tree *as* a spruce, or a Norway spruce to be precise. Whilst the tree indeed exists mind-independently, the structuring capabilities that we need for our understanding of that tree is relative to our conceptual frameworks. For van Kooten Niekerk, the differences in perception, e.g. seeing the tree *as* a Christmas tree or a Norway spruce, are explained in social and cultural terms, with a particular emphasis on the role of language in structuring perceptions. It is due to the social dependency of our conceptualisations that "perception does not give a precise reflection of the world" (van Kooten Niekerk, 1998: 56).

Hence, all knowledge claims are grounded on prior interpretative frameworks. We use certain scheme-relative factors to classify mind-independent objects such as whales as 'non-fish' or a tree as a Norway spruce. As such, "neither in science nor in theology will we derive much insight from simply staring at raw data. The chosen initial point of view must be open to correction in the light of further experience, but it cannot be dispensed with" (Polkinghorne, 1996a: 15). Scientific observation always occurs from a certain vantage point and, as a result, our resulting knowledge claims are scheme-dependent.

2.4.2 Unpacking Metaphysical Package 2: Scheme-Independent Reality

Is critical realism then a form of Kantianism? Whilst critical realists agree with Kant and the conceptual relativists that our knowledge claims should be understood in terms of being scheme-dependent, critical realists do maintain the existence of a mind-independent reality – against conceptual relativists. Soskice, for example, endorses the cautious metaphysical stance of realism, according to which

> The scientific realist's argument is that the success of science means that its practitioners must assume not only that the work, its structures, and relations exist independently of our theorizing but also that our theorizing provides us with access to these structures, limited and revisable as that access may be at any given time (Soskice, 1985: 122).

[30] See van Kooten Niekerk, 1998: 56.

Soskice makes a conventional scientific realist claim here, maintaining the mind-independent existence of reality and its furniture. Insofar as critical realists accept some form of the *phenomena*, it should be understood in terms of an expression of the provisional nature of our knowledge claims about the things-*in-themselves*, rather than things-as-they-appear-to-us. So, where conceptual relativists reject the *noumena*, critical realists eliminate the *phenomena*, because our knowledge claims do refer to reality-in-itself.

Yet critical realists consider the Kantian *noumena*/*phenomena* distinction as unhelpful for their metaphysical considerations. What is more, they explicitly reject the Kantian distinction. For critical realists, there is no unbridgeable abyss between the *phenomena* and *noumena*, since the epistemic subject engages directly with reality-in-itself. Knowledge about the thing-in-itself may well be incomplete and influenced by conceptual frameworks, yet the object of knowledge is nevertheless the thing-in-itself. Gilkey, who belongs to the more outer circle of the critical realist family, illustrates this aptly by claiming that,

> I am neither a Kantian nor interested in defending Kant's particular epistemology. Insofar as Kant represented a 'critical realist' tradition, however, this volume shares that viewpoint with him. By 'critical realism' is meant the view that experience and knowing are a response to an external world but also a response in human signs, symbols, categories, i.e. in human language (Gilkey, 1993: 213-214).[31]

Gilkey here points out the conceptual-dependence of our knowledge claims as a response in human language, whilst maintaining that this response is about reality-in-itself, without a veil.

Our knowledge claims are thus considered to be 'reality depicting', according to critical realism. As Barbour puts in in his first contribution to *Zygon*, "avoiding these extremes [i.e. positivism, instrumentalism and idealism], I would tend to end up where Northrop does, with a kind of critical realism that says, 'Yes, science is trying to describe reality, but it does so only very indirectly in highly symbolic and abstractive language'" (Barbour, 1966a: 29-30). Barbour considers correspondence with the

[31] See also Gilkey, 1993: 62.

external reality as the definition of truth and he uses phrases such as 'objective patterns', 'empirical evidence', 'empirical basis', and 'empirical agreement' to illustrate his thinking.[32] Hence, Barbour seems to assume an objective reality-in-itself to which our knowledge claims directly and immediately refer to. This objective or empirical reality also causally influences the formation of knowledge. Theories and doctrines have to agree with reality, and the world seems to interact with the epistemic subject.[33] Knowledge, therefore, is produced in the interaction with reality, and the resulting theories provide a representation of reality, i.e. theories are reality *depicting*, a feature which is missing in the conceptual relativism of Goodman and Putnam, where models and theories are understood as reality *constructing*. As said before, insofar as critical realism accepts the *phenomena*, it is an expression of the provisional nature of our knowledge of the things-in-themselves.

Another explicit rejection of the unbridgeable abyss the *noumena* and the *phenomena* amongst critical realists can be found in Polkinghorne's oeuvre on critical realism, where he, for example, points out that,

> Immanuel Kant notoriously disconnected the two, alleging that human beings can only know phenomena (the appearances of things) and not the noumena (things in themselves). Scientists, on the other hand, take a wholly different tack. The philosophical context of scientific practice is a commitment to realism, the belief that what we know is a reliable guide to what is actually the case. Without the conviction that science's knowledge is actually telling us what the physical world is like, it is difficult to see why the labour and not infrequent frustration involved in pure scientific research should ultimately considered worthwhile. This conviction is reinforced by the way in which the physical world so frequently proves radically different from our prior expectation (think, once more, of quantum theory). The feel of doing science is the feel of discovery. It is the nudge of nature that shape our scientific thinking (Polkinghorne, 2009: 81).

A similar rejection of Kant's distinction can also be found in Polkinghorne's earlier work, where he, for example, suggests that "quite the contrary to what Kant supposed,

[32] See Barbour, 1966b: 172-174; *idem*, 1997: 110.
[33] See Barbour, 1997: 168.

we do not impose a grid of expectation upon experience as the a priori necessity for its accessibility to us, but our manner of knowing has to be conformed to that with which we have to deal" (Polkinghorne, 1991:15).[34] For Polkinghorne, science engages directly with the external world. Epistemology is a reliable guide to the actual structures of nature, and this also applies to theology, or, to use Polkinghorne's oft-quoted phrase 'epistemology models ontology', according to which "what we can know is a reliable guide to what is the case" (Polkinghorne, 2005: 85).

Similar to Barbour, the assertion that objective reality causally influences the formation of scientific theories and models is pivotal to Polkinghorne's stance, because it is the correspondence with objective reality that confirms the truthlikeness of proposed scientific theories. It is objective reality that "controls what can be known about it and the way in which that knowledge must be expressed" (Polkinghorne, 1991: 15). However, even though there is a causal relationship between objects-in-themselves and scientific theories, knowledge of these objects is not exhaustive, because Polkinghorne maintains that maps of reality are still inexact, conceptually relative and incomplete. In agreeing with Barbour's and Polkinghorne's metaphysical considerations, Peacocke here uses the phrase 'candidates of reality' to illustrate the provisional nature of our knowledge claims, whilst maintaining that these knowledge claims refer to a mind-independent reality. As Peacocke puts it, "scientists *aim* to depict previously hidden or unknown structures and processes of the real world, and the terms in their theories and the features of their models are intended genuinely to refer to a real world" (Peacocke, 1984: 25).[35] In Peacocke's account we find again this correlation between the conceptual scheme-independence of reality and the conceptual scheme-dependent nature of our knowledge claims as 'candidates of reality'.

For critical realists in general, then, the world must be understood in realist terms, existing independently of the epistemic subject, and allowing scientists and theologians to uncover its structures which exist independently of us. Our explanations, relying on models and analogies, are reality depicting, or tell us something about the way the world really is. Yet, our knowledge claims about the mind-independent reality are social and context-relative. For example, divisions we make between objects such as 'fish' and 'non-fish' are considered scheme-relative,

[34] See also Polkinghorne, 1998: 104, where he claims that it is possible "to gain knowledge of its [i.e. the physical world's] actual nature". See also Polkinghorne, 1996a: 14, 16.
[35] Italics: Peacocke.

because there are numerous ways in which objects could have been divided. Yet, the mind-independent objects do causally affect our divisions, i.e. reality informs our constructs through correspondence, whilst Soskice also recognises the reality depicting nature of these constructs. Thus, we have epistemic access to the ontological structures of reality, despite the fact that our knowledge claims may well be incomplete, provisional, and influenced by psychological, sociological and historical factors.

2.5 Critical Realist Metaphysics: A Definition

The common thread, then, of critical realist metaphysics is that our knowledge claims are scheme-dependent and embedded in a particular sociological and historical context, whilst the critical realist also recognises the direct and immediate reference of these knowledge claims to a scheme-independent, and, hence, mind-independent reality-in-itself. That there are elementary particles, for instance, is a state of affairs about our physical reality. But that these elementary particles have both wave and particle properties at once depends on the conceptual framework scientists use in studying nature. Kant's mistake, critical realists seem to maintain, was to place a 'separate world', i.e. the realm of the *phenomena*, between the epistemic subject and the object of knowledge. For critical realists, our knowledge may indeed be provisional, incomplete, and conditioned on sociological and psychological factors, but it is nevertheless knowledge about the object-in-itself and, thus, immediate and direct.

Contrary to the conceptual relativists, such as Goodman and Putnam, critical realists maintain that the dependence of our knowledge claims on conceptual schemes is just about the quality of these claims of mind-independent physical objects, rather than an epistemological or semantic stance bearing with it profound metaphysical consequences, i.e. the mind-dependent existence of reality. This difference between conceptual relativism and the critical realist stance on these matters is judiciously described by Niiniluoto, who, arguing against mere subjective idealism, points out that "the human construction of *knowledge* should not be confused with the construction of the *reality*" (Niiniluoto, 1999: 207).[36] For the critical realist, it is our *view* of reality that changes, or the so-called 'lenses of one's worldview', rather than the world itself,

[36] Italics: Niiniluoto.

when one structures reality by using theories, models, or concepts. An atom, for example, does not change when a physicist describes how the atomic nucleus consists of protons and neutrons that are bound together by the nuclear force, because the existence of the atom is mind-independent.[37] Yet, the structuring of atoms in terms of atomic nucleus, protons, neutrons and nuclear force depends on the currently accepted conceptual framework. It is this conceptual framework that is constructed by human minds and, thus, is by definition 'mind-dependent'. Over and against Kant, Goodman and Putnam, critical realism thus maintains the cautious ontological presupposition that there is an actual world out there that exists independently of human minds and to which our knowledge claims refer directly and immediately.

Thus, critical realists do not want to jeopardise their realist commitments, and scientific and theological objects are neither shaped nor constructed by our conceptual frameworks. Polkinghorne's 'maps of reality' and Peacocke's 'candidates for reality' are about *getting things right*, pointing towards the aim of science and theology to map onto mind-independent reality. Our knowledge is indeed fallible and dependent upon a particular conceptual framework – contrary to naïve realists. Nonetheless, it is knowledge about the mind-independent reality and its furniture – against ontological idealism, Kant and conceptual relativism.

Since a good deal of the discussion here is epistemological in nature or points towards epistemological considerations, let us now turn to the second key principle of our taxonomy of critical realism, namely its epistemological stance.

[37] A counter-example here would be hallucinations, where the things observed are merely figments of the imagination of the person hallucinating. In the case of hallucinations, there is no real external, mind-independent object, because the hallucinated object is a pure creation of the mind. When we are neither hallucinating, nor dreaming, nor having any other 'delusional experiences', the epistemic subject directs his or her perception to external, mind-independent objects.

CHAPTER 3

CRITICAL REALISM AND EPISTEMOLOGY

An Exploration

In our taxonomy, we have defined the epistemological commitment of critical realism in terms of our inability to attain conclusive and exhaustive knowledge. Critical realism claims – against infallibilism – that all knowledge is prone to error, whilst recognising the possibility that we may have real knowledge about external reality – against sheer scepticism. This epistemological position is commonly known as 'fallibilism'. After providing some introductory remarks with regard to the epistemological commitments of critical realism (Section 3.1), we first need to provide a framework for understanding the critical realist's commitment to fallibilism. Using the backdrop of the classical philosophical account of knowledge as justified true belief, I will distinguish three views regarding the quality and justification of our knowledge claims: infallibilism, scepticism, and fallibilism (Section 3.2). Section 3.3 will provide an account of the critical realist's endorsement of fallibilism in the science-theology exchange. If fallibilism holds true, then there is a challenge for critical realists to explain how fallible knowledge is asserted to be real knowledge of reality 'out there'. Therefore, in the subsequent section, we will explore the criterion of 'withstanding serious criticism' as a possible solution that critical realism provides to ward off its critics (Section 3.4). But the endorsement of fallibilism by critical realism has received sharp criticism. In particular, Michael Durrant has raised a significant critique against the endorsement of theological fallibilism by Soskice in the literature of critical realism, which will be explored in Section 3.5. Section 3.6 then will provide a number of concluding reflections on the epistemological commitments of critical realism.

3.1 Critical Realism and its Epistemological Considerations

Epistemological concerns lie at the heart of critical realism. In particular, it has been critical realism's epistemology that has demarcated it from naïve views of science or theology, and critical realists have been particularly inclined to use, as it were,

'epistemic building blocks' to establish the so-called 'bridge' between science and theology. Paul Allen, for example, considers critical realism to be an 'epistemological breakthrough' in the science and theology field, where critical realism provides an 'epistemological basis' for grounding the relationship between science and theology.[1] Similarly to Allen, Niels Henrik Gregersen also uses terms related to epistemology to define the role of critical realism in science and theology. For Gregersen, critical realism "offers theology a sort of epistemic parity with science" (Gregersen, 2004: 77).[2] Although we have described critical realism in terms of family resemblances, as discussed in Chapter 1 'The Evolution of Critical Realism', there is a surprisingly common theme that – as far as I can see – all critical realists seem to endorse the epistemological stance of fallibilism in defence of the – as Gregersen suggests – epistemic parity between science and theology.[3]

In general terms, the epistemology of critical realism is grounded on the sceptical view that all beliefs, theories, and models are provisional and prone to error. Absolute certainty about the conclusions of science and theology is considered to be untenable. Polkinghorne, for example, asserts that "our understanding of the physical world will never be total, but it can become progressively more accurate" (Polkinghorne, 2007: 22). Critical realists affirm that while science does indeed progress, the sceptical inference still holds true that, for example, even the surest theories of science have been repeatedly proven to be false or non-referring.[4] As Peacocke puts it, "no one would want to be taken as attributing final truth to today's scientific theories – the history of science itself makes that impossible" (Peacocke, 1984: 23). Hence, due to the plethora of scientific theories that were once considered to be (approximately) true and yet proven to be false, critical realists maintain that there is no guarantee that our

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[1] See Allen, 2006: 15, 16. See also Paul la Montagne, for instance, who characterises the distinctive features of critical realism in epistemological terms. See la Montagne, 2001: 14.

[2] Others, however, disagree with the primacy of epistemology in defining critical realism. Alan Padgett maintains that it is a mistake that "most definitions of realism have focused on epistemology" as "it distracts us from the real force of critical or dialogical realism, which is ontological" (Padgett, 2003: 31). Padgett's assessment is valid to a certain degree. A strong emphasis on the epistemological stances of critical realism will provide a rather distorted view on its tenets, because critical realism also consists of metaphysical, semantics, and theological considerations. However, the issue of a distorted view also holds for Padgett's argument for the primacy of ontology in defining critical realism; what is more, the real force of critical realism might well not be found in ontological considerations only. It is the combination of the metaphysical, epistemological, and semantic stances that constitutes critical realism, and each constituent should be considered as an approach to understanding the critical realist's endeavours.

[3] See p. 24ff.

[4] See also Laudan, 1981 for a similar argument in philosophy of science,

current scientific theories will be certain and true. This scepticism towards the absolute certainty of theories and models is not limited to science only. In the context of theology, critical realists also hold a sceptical attitude towards the certainty of theological knowledge. As Polkinghorne puts it, "when we turn to religious belief, it too cannot lay claim to certainty beyond a peradventure – for believers live by faith and not by sight" (Polkinghorne, 2009: 126). Therefore, all scientific and theological models and concepts are by definition revisable and inadequate, and both science and theology are characterised by an epistemic struggle to understand their respective realities.

But let us probe deeper into the epistemological considerations of critical realism. Whilst fallibilism – the view that all knowledge is vulnerable to failing – is the default position for critical realism, there is at least one significant issue with this stance. In the previous chapter on the metaphysical stance of critical realism, we explored the interplay between the scheme-independent reality and the scheme-dependent nature of our knowledge claims.[5] Due to its scheme-dependent nature, our knowledge claims are considered fallible. However, this conclusion leads to an inherent epistemological concern for critical realism, which Paul la Montagne judiciously states as a concern to "explain how and why knowledge that is admitted to be mediated and fallible is nonetheless asserted to be real knowledge of a truly other" (La Montagne, 2001: 14). But how can knowledge that is fallible be considered as a relatively successful predicator and explainer of reality? It is this inherent concern that will form the backdrop of our explorations into the epistemological stance of critical realism, because – as far as I can see – critical realists provide a nuanced answer to this challenge. But before delving into the epistemology of critical realism, a framework and vocabulary is required in order to put flesh, as it were, on the epistemic bones of critical realism.

3.2 Infallibilism, Scepticism and Fallibilism

In explaining the nature of knowledge, a helpful starting point is the traditional or orthodox answer to the question of what it is that subject (S) knows of a particular theory, hypothesis, or proposition (*p*). According to this classical account of

[5] See p. 66ff.

propositional knowledge, knowledge should be distinguished from mere opinion or belief on the basis of three conditions:

> S knows that *p* if
>
> (1) S believes that *p*
>
> (2) *p* is true
>
> (3) S's belief that *p* is justified or well-founded.[6]

Conditions (1) and (2) are the least contentious. According to the first condition, knowing that *p* requires that S genuinely believes that *p*. Take for example the proposition that 'someone is standing outside the door'. In order to believe this proposition, S has to believe that someone is outside the door. For if, in saying that 'someone is standing outside the door', S is telling a lie, then S does not believe *p* and it thus cannot be said that S knows that *p*. Yet, mere belief is not considered to be sufficient and, thus, a second condition is required, according to which S does not only believe that *p*, but *p* must also be true. If S is to know that someone is standing outside the door, then there must really be someone outside the door. If there is no one standing outside the door, then *p* is false and S does not know that *p*. However, even if the first and second condition have been met, there are cases where the true belief is actually a lucky accident, or it just happens to be true. S could have guessed, for example, that someone is outside the door, or it could have been a hunch. Therefore, in order for S to claim that she knows that *p*, S must be able to justify her belief or give reasons that *p* is the case. Only if S is able to demonstrate that *p* by, for instance, opening the door and looking to see if someone is standing outside the door, then can it justifiably be said that S knows that *p*. Thus, the classical definition of propositional knowledge is an epistemological instrument to make a distinction between *genuine knowledge* and *mere belief*.[7]

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[6] For a more in-depth overview of the classical account, see Lemos, 2007: 1-43; Pritchard, 2009: 3-21.

[7] The justified true belief account of propositional knowledge has received strong criticism, in particular from a two-and-a-half-page essay 'Is Justified True Belief Knowledge'. In this essay, Edmund Gettier sets out to demonstrate that the three conditions are insufficient for knowledge by presenting a set of counter-examples. In these counter-examples, Gettier pointed out that there are cases where one could have a justified true belief, and yet lack knowledge of what is believed to be true, due to the fact that this belief is actually acquired via luck. Consider the following example (Pritchard: 2009, 11):

> Smith is a shepherd. One day he looks into the field and he sees a sheep-shaped object. As a consequence, Smith forms the belief that there is a sheep in the field. However, Smith is not

Yet, contrary to conditions (1) and (2), condition (3) and in particular the extent of condition (3) is highly debatable. For example, is it possible to have complete and unerring justification (*j*)? Is there a certain level of justification required for S to know that *p* is true? How should we define the relationship between S's reasons for believing that *p* and *p*'s truth? Does, for instance, *j* guarantee that *p* is the case? Traditionally, three general solutions have been suggested for answering these important questions: namely, infallibilism, scepticism, and fallibilism as the middle ground between these two.

3.2.1 Infallibilism and its Epistemological Commitments

First, infallibilism generally maintains that if S knows that *p*, then it is impossible for S to be in error about *p*. Yet infallibilism comes in many forms, each emphasising or reinterpreting one of the conditions of the classical account. For example, an infallibilist could limit knowledge to necessary truths. According to this, if S knows that *p*, then *p* is necessarily true in every instance of knowledge. Another option for infallibilists is putting a strong emphasis on the second condition of the justified true belief-account, asserting that one cannot know something that is actually false. Thirdly, and probably the most widely accepted view, infallibilists accept conditions (1) and (2), but interpret condition (3) in a stronger sense than the classical account does. Rather than asserting that S has justified reasons for believing that *p*, an infallibilist maintains that S has conclusive knowledge that *p* is the case. The reasons S has for believing that *p* guarantee or entail *p*'s truth. S is, as it were, absolutely certain about the truth of *p* in an objective way.[8] Contrary to the first instance of infallibilism, this third view is not merely limited to necessary truths. Contingent truths, such as the aforementioned proposition 'someone is standing outside the door', could also be justified with absolute certainty.

It is this third kind of infallibilism, where knowledge is understood in terms of absolute certainty, that resonates with the critical realist construal of naïve realism. In

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looking at a sheep. By sheer coincidence and unbeknownst to Smith, he is looking at a sheep-shaped stone, which obscures the view of the real sheep standing behind the sheep-shaped object.

Smith's belief is thus true and justified as there is a real sheep in the field behind the sheep-shaped object. Yet, it would be inaccurate to say that Smith knew that there was a sheep in the field as he saw a sheep-shaped stone rather than a real sheep. Therefore, Smith's justified true belief cannot be considered to be an instance of knowledge, because he ultimately gained this knowledge by mere luck.

[8] In other words, if the probability for *p* is > 0, then *p* is epistemically possible for S, assuming that if S knows that *p*, then not-*p* is not epistemically possible for S

the previous chapter on the metaphysical stance of critical realism, naïve realism was introduced as the idea of the human mind exhaustively uncovering the real structures of reality without any mediation of conceptual frameworks.[9] Sense-experience is considered to be the source of immediate knowledge of the object-in-itself. Underpinning this rather naïve attitude towards their metaphysics is the belief that if science has proven *p* to be true, the belief of scientists in *p* is infallible and their descriptions are certain and without any form of ambiguity. As Gilkey construes it, naïve realists maintain that "the cosmos is what is real, and the cosmos is described without ambiguity by scientific inquiry" (Gilkey, 1993: 50). As a result, once *p* has been discovered and described, it will become a *permanent* part of our scientific knowledge.

Yet, sceptical arguments give reason for rigorous doubt regarding the infallibilist's strong interpretation of the third condition. There are, sceptics maintain, numerous reasons to be pervasively mistaken about a certain belief in *p*, even if we hold the belief with utmost certainty. For example, a sceptic could point out that the belief that S holds infallibly is actually grounded on numerous other beliefs that S happens to hold as well, such as the belief that S's senses do not deceive him. Yet, the sceptic's strategy then is to raise doubt about these other beliefs, and in order to justify these other beliefs S will rely upon another set of beliefs, *ad infinitum*. Hence, the warranting of beliefs on the basis of other beliefs causes an infinite regress, which eventually leads to a set of beliefs that are considered unjustified. The infallibilist's assertion that there are instances of knowledge where it is impossible for S to be in error about *p* is thus proven to be subject to infinite regress.

3.2.2 Opposing Infallibilism: Scepticism

Hence, the opposite of infallibilism is scepticism. Scepticism challenges the infallibilist's idea of absolute certainty in at least two ways: scepticism about knowledge and scepticism about justification.[10] According to the former, S can have little, if any, knowledge at all. Even though S might be justified in believing *p*, the level of justification will never be sufficient for knowledge, due to the fact that all justification is subject to the aforementioned infinite regress. For sceptics about knowledge, knowledge does not actually exist, as it is impossible to ever really have a

[9] See p. 51-52. See also p. 45.
[10] See Audi, 2003: 293-294.

justified true belief. Scepticism about justification, on the other hand, denies the possibility of much, or any, justification for believing that *p* is the case. Yet, it might be possible, for example, for S to have knowledge because knowing that *p* does not require any form of justification. Put differently, it is possible to be a sceptic about justification, whilst rejecting scepticism about knowledge, and vice versa. Furthermore, there is also a distinction between global scepticism and its local counterpart. Global or radical sceptics maintain that it is universally impossible to have knowledge about *p* or have any justification for believing *p*. In contrast, local scepticism challenges the universality of global scepticism, pointing out that S might well have knowledge or be justified in certain domains. For example, S, according to local scepticism, might well have knowledge about the past or his own mental states.

3.2.3 Fallibilism as the Via Media between Infallibilism and Scepticism

Since scepticism is, for many, a position too strong to defend, others have aimed to establish a middle ground between infallibilism and scepticism by endorsing what Charles Sanders Peirce called fallibilism as the *via media*. Standing in the rich tradition that stems from the work of John Stuart Mill and Peirce, fallibilism is the epistemic claim that no belief can ever be conclusively justified, due to the fact that all human knowledge is prone to being mistaken. Yet, contrary to the strong claims of scepticism, S is still able to know that *p* is the case, despite the inconclusive justification. Rather than addressing all possibilities of error, as sceptics require, fallibilists maintain that it is sufficient only to address the relevant possibilities of being mistaken in order to have knowledge, which allows fallibilists to escape the infinite regress of scepticism. Fallibilists maintain that there is a gap between the evidence or justification and S believing *p* on the basis of *j*. Due to this, conclusive justification is thus not required for S to know that *p* is true. Hence, fallibilists are sceptical about justification rather than the possibility for S to have knowledge.

The standard account of fallibilism can be divided into two alternative expressions.[11] According to the first expression,

[11] See Reed, 2002: 144. See also Brueckner, 2005: 384.

S fallibly knows that *p* if

(1) S believes that *p* on the basis of *j*

(2) Yet, S's belief that *p* on the basis of *j* could have been wrong.[12]

Fallibilists who ascribe to the first expression maintain that S's belief that *p* could have been in error, even though S has given good or even true reasons for believing that *p* is the case. In more general terms, there is always the possibility of being mistaken and there remains possible doubt whether or not *p* is true. Due to this ever-present possibility of being in error, S cannot be fully certain of not being in error in this particular instance.

The second expression, however, subtly reinterprets the third condition of the classical account of knowledge as follows:

S fallibly knows that *p* if

(1) S believes that *p* on the basis of *j*

(2) Yet, *j* does not guarantee that S's beliefs that *p* is true.[13]

Rather than asserting that S's belief that *p* could have been invalid, despite S having valid grounds for believing that *p*, the second expression asserts that S has valid justification for believing that *p*, and yet *not-p* is the case. Those who ascribe to this second formulation deny the entailment principle, according to which *j* guarantees that *p* is true or *p*'s truth is logically implied by *j*.[14] An alternative approach to the entailment principle is, for example, asserting that *j* makes S's belief that *p* probable, rather than guaranteeing that *p*. Yet, this notion of probability implies the possibility of being in error about *p*, despite S's evidence for believing that *p*. Hence, both expressions of the standard account intend to demonstrate the assumption that knowledge is always fallible, because either S's believe that *p* is false, despite valid reasons or evidence, or *j* does not entail that *p* is true. In the next section (Section 3.3), I will argue that it is this fallibilist epistemology that is a common theme of the various

[12] For examples of this first expression, see Hetherington, 1999: 565; Pritchard, 2005: 17. Pritchard, for example, defines infallibilism as the ability to "rule out all possibilities of error associated with that proposition" (Prichard, 2005: 17).

[13] For examples of this second expression, see Cohen, 1988:91; Jeshion, 2000: 335.

[14] The reason for denying the entailment principle might be Descartes' assertion that the senses deceive the observer. See Descartes, 2008: 13 (AT VII 18).

accounts of critical realism in science-theology literature, and in the subsequent section (Section 3.4) I will engage the internal challenge of explaining how fallible knowledge is still considered to be reliable by introducing the criterion of 'withstanding serious criticism'.

3.3 Critical Realism and the Fallibilist Stance

In this section, I argue that despite the variety of nuanced views that go under the name of critical realism, commitment to fallibilism plays an important role in the literature on critical realism in science-theology scholarship. As Soskice puts it in the context of science, "it is part of the attraction of the critical realism we have been discussing that it need not hold that the terms of a mature science mirror the world in an unrevisable fashion" (Soskice, 1985: 132). Against, say, those who endorse the claim that scientific knowledge is infallible, critical realists are swift to point out the numerous theories that were once thought to be true, but are now proven to be false or non-referring. History has shown a plethora of such ideas and theories, and time and again scientists have had to revise their account in light of new evidence. Any scientific knowledge claims might turn out to be false, and this also applies to our future predictions. This state of affairs leads critical realists to the rather sceptical conclusion that all knowledge – even the surest theories of science – is prone to error and all theories are provisional. Or, as Polkinghorne puts it, "science is never absolutely certain, nor is its methods absolutely clear cut" (Polkinghorne, 2000: 33).

In addition to this historical argument against infallibilism, the critical realists' endorsement of a fallibilist's view of knowledge should also be understood in terms of their metaphysical commitments discussed in the previous chapter. Against naïve realism, critical realism assumes a correlation between mind, object and conceptual framework. Whilst reality is understood in terms of it existing scheme-independently, our knowledge claims of that reality are considered to be relative to our conceptual schemes. In recognising the active contribution of the human mind to the process of acquiring knowledge, critical realists maintain that all knowledge claims are constructions with which we attempt to understand mind-independent reality. Theories, models, and beliefs do not simply latch onto mind-independent reality, allowing scientists or theologians to simply read out their discernments of reality. Instead, knowledge is mediated and acquired through a creative interpretative process, in which the epistemic subject participates in acquiring knowledge. Furthermore, none

of the conceptual frameworks are considered to be "representationally privileged" (Soskice, 1985: 132). As such, there exist a plethora of conceptual frameworks, each representing the scheme-independent reality with various degrees of success and none of these schemes representing reality exhaustively and with certainty. Due to this state of affairs, all knowledge claims are considered to be partial, allowing for the possibility that all knowledge is prone to error.

Whilst being rather sceptical about the certainty of knowledge, critical realism does not – against scepticism – deny the possibility of acquiring valid, albeit inconclusive, knowledge. For critical realists, the certainty or truth of knowledge is a matter of degree, rather than kind. Theories and beliefs are considered to be approximately true. Polkinghorne in particular has endorsed the notion of truthlikeness or verisimilitude in the literature on critical realism. According to Polkinghorne

> The maps that science makes of the physical world have always had to be open to revision when territory comes to be surveyed on a more intimate scale than had been explored hitherto. Yet these maps have proved reliable and trustworthy at the level of detail that they profess to describe. Science's achievement is not absolute truth, but it can rightly claim verisimilitude (Polkinghorne, 2005: 3).[15]

Or, in an earlier work, Polkinghorne makes a similar argument, where he states that

> There *is* a middle way between intellectual certainty and intellectual doubt, between logical guarantees on the one hand and solipsistic individualism or social determinism on the other. This middle way is often called critical realism: 'critical' because it acknowledges the problematics of motivated belief and concedes our inability to rid it of all intellectual precariousness; 'realism' because it recognises, nevertheless, that we can attain a verisimilitudinous grasp of reality (Polkinghorne, 2000: 33).[16]

[15] See also Polkinghorne, 1996b: 8; *idem*, 2011: 7. However, it is rather disappointing that Polkinghorne does not go to any length in explaining what he actually meant with 'verisimilitude', using it in a kind of slogan-like approach. Polkinghorne probably assumed that its meaning is clear enough without a definition, and he fails to refer to recent – and in particular post-Popperian – developments on the notion of verisimilitude. See Niiniluoto, 1984; *idem*, 1987; Leplin, 1985; Kitcher, 1993.
[16] Italics: Polkinghorne.

Rather than being exhaustive, these scientific or even religious maps approach the truth. Current scientific maps are considered to be inadequate but, nevertheless, closer to truth, or having a higher degree of truth, than previously held maps, but they still remain fallible.[17]

Whilst critical realists may have found a safe haven in the epistemological position of fallibilism, the internal tension that arises from explaining how a certain belief is reliable or truthlike but nevertheless prone to error still remains. As far as I can see, some critical realists suggest a criterion of 'withstanding serious criticism' to maintain that our knowledge claims are fallible, but nonetheless reliable. In the following section (Section 3.4), we will probe a bit deeper into this criterion.

3.4 Criterion of Withstanding Serious Criticism

In order to clarify how fallible knowledge can nonetheless still be reliable, some critical realists have introduced the notion of 'critical reflection', which allows *S* to still have knowledge of *p*. What separates critical realism from naïve forms of realism is the acknowledgement that "knowledge requires critical reflection on perception" (Peters and Peterson, 2013: 193). All acts of knowledge are challenged by a certain form of critical reflection. A helpful way of characterising this argument is to introduce the criterion of 'withstanding serious criticism'; a phrase not used amongst critical realists, but it seems clear that such a criterion seems to be implied in at least some of the critical realists' accounts.[18]

Knowledge, according to this criterion, is accepted provisionally if it has withstood serious criticism, i.e. we are unable to provide sustained arguments *against* S's belief that *p*. If we succeed in providing sufficient evidence against *p*, and thus *p* is considered to be false, then S is not justified in believing that *p* is the case. The luminiferous aether was once thought to provide a reasonable explanation for the propagation of light through empty space, for example, but the failure of the Michelson-Morley experiment had puzzled the scientific community up until

[17] Critical realists have put forward various arguments to explain why science is able to acquire approximate truth. These arguments will be explored in Chapters 5 and 6 on 'The Humanisation of Science'.

[18] As will be discussed down below, both Barbour and Peacocke suggest criteria that allow knowledge that is vulnerable to failing to remain reliable. The genesis of the phrase 'withstanding serious criticism' can be found in Alan Musgrave's *Common Sense, Science and Scepticism*, where he coins this criterion as an alternative principle of rationality to scepticism and dogmatism. Whilst they neither engage with nor mention Musgrave, critical realists seem to suggest something similar to Musgrave's criterion, i.e. for *x* to be reasonable it should withstand serious criticism. See Musgrave, 1993: 280-286.

Einstein's special theory of relativity and eventually led to the debunking of the existence of such an aether. The theory of the luminiferous aether failed to withstand serious criticism, critical realism would maintain, and should thus be considered to be false. On the other hand, there are numerous scientific theories that have withstood serious criticism, such as the theory of evolution, the theory of relativity, and quantum theory. Thus, believing in these theories is considered to be reasonable (until new evidence is brought to light to debunk the theory). A similar approach could also be applied to our theological knowledge claims. For example, archaeological findings, textual evidence, or scientific results could shed new light on certain beliefs. A well-known example here is the story of creation, where scientific findings have challenged the belief in a literalistic historiographical reading of the Genesis creation story.[19]

Where can we find such a criterion in the literature of critical realism? According to critical realists, critical reflection upon our beliefs consists of applying several criteria in order to assess the knowledge claims of scientific theories or religious beliefs. Barbour, for example, distinguishes four such criteria.[20] First, knowledge claims should agree with the relevant data. Second, there should be a consistency with relevant theories and beliefs, devoid of any contradictions. Third, S's belief that *p* is true should have a certain comprehensiveness or generality, taking into account other beliefs and theories that are deemed relevant to S's belief. Fourth, knowledge claims should have a certain fertility, or should make it possible to infer other knowledge claims. Even though absolute certain and true knowledge is untenable, these four criteria provide a reliable process for acquiring knowledge. Barbour illustrates this judiciously in the case of science:

> science does not lead to certainty. Its conclusions are always incomplete, tentative, and subject to revision. Theories change in time, and we should expect current theories to be modified or overthrown, as previous ones have been. But science does offer reliable procedures for testing and evaluating theories by a complex set of criteria (Barbour, 1997: 110).

Or, in the context of theology, Peacocke suggests that the warrant for a theological statement to depict reality "can come only from successful application of the criteria

[19] See Harris, 2013 for an excellent study on the creation story.
[20] See Barbour, 1997: 109; 113. See also Poole and Southgate, 2011: 16 for a different list of criteria.

of reasonableness which warrant inferences to the best explanation" (Peacocke, 1993: 17). For Peacocke, the criteria of reasonableness consist of fitting "with the data, internal coherence, comprehensiveness, fruitfulness and general cogency" (Peacocke, 1993: 15). When a theological statement or a scientific theory meets these criteria, then it should be considered to be an inference to the best explanation possible, allowing theologians to justifiably infer that a particular statement is probably true. With these criteria in hand, we could give certain theological statements an epistemic advantage over and against statements that do not fully meet these criteria. It is thus, according to these critical realists, the process of applying these criteria to our knowledge claims that allows for S's fallible knowledge to withstand serious criticism and, hence, become reliable.

How then should we understand this notion of 'criteria of reasonableness' or 'withstanding serious criticism' that some critical realists endorse in the wider context of epistemology? Although critical realists do not position their epistemological considerations in the wider debates of epistemology, I will try to shed some light on this by pointing out that the introduction of the criterion of 'withstanding serious criticism' leads to a redefinition of the classical account of *justified true belief*. Whereas the traditional account demands justification for *p* itself, critical realists argue that the notion of 'withstanding serious criticism' or meeting the criteria of reasonableness justifies S in believing that *p* is the case. It is not the case that *j* entails the truth of *p*, but *j* warrants S's belief in *p*, even though S is unable to justify *p* conclusively. Take the aforementioned proposition that 'someone is standing outside the door' as an example. S could put forth various reasons why this proposition is true. For example, she heard a knock on her door; or, she made an appointment with a student at 1pm and, looking at her watch, she sees that it is 1pm; or, she opened the door and saw someone standing outside her door. Given the body of evidence for the proposition, S's belief in *p* is reasonable, yet there is no sufficient amount of evidence for S to have absolute certainty about *p*, i.e. *j* does not guarantee *p*'s truth. All *j* does is to make S's belief that there is someone standing outside her door reasonable. The difference between this and the classical account of propositional knowledge is rather subtle, yet important and I suggest that it should therefore be redefined as follows:

S fallibly knows that *p* if

(1) S believes that *p*

(2) *p* approximates truth

(3) S is justified in believing that *p* if *p* 'withstood serious criticism'.[21]

Hence, this redefinition of the classical account suggests that it is reasonable for *S* to accept or belief that *p*, even if *p* itself is not justified conclusively, due to the fallibilistic nature of knowledge. Redefining the classical account in such a way allows critical realists to make room for *S* to believe in a falsehood or hold certain beliefs that will eventually turn out to be invalid. Even the surest scientific theories have been overthrown and replaced by theories that are considered to be more consistent with new data, yet our belief in that particular scientific theory was once considered to be reasonable because it withstood serious criticism. In this sense, with the aforementioned criterion of 'withstanding serious criticism' in mind, both science and theology lead to reasonable and reliable beliefs, rather than infallible knowledge. But what to do with fallibilism if certain propositions, such as in logic or theology, are actually infallible? In the following section (Section 3.5), we will engage with this particular problem for the critical realist's endorsement of epistemological fallibilism.

3.5 Theological Fallibilism and the Problem of Necessary Truths

Critical realists consider all knowledge to be fallible, and – at least for some – with the criteria of reasonableness in hand, affirm that our knowledge claims are still reliable. However, critical realism has received sharp criticism regarding its commitment to fallibilism, in particular in the context of theology. Whilst fallibilism in science seems to be an obvious position to take, commentators on critical realism are particular concerned about applying fallibilism to theology. Michael Durrant has raised this concern in particular against the theological work of Soskice, but, if Durrant's criticism holds true, it may well have consequences more generally for critical realism and its epistemological considerations. Therefore, in the following sections, we will probe a bit deeper into Durrant's criticism of theological fallibilism and I will suggest some considerations – using the work of Susan Haack – to soften the blow for critical realism.

But before we delve into Durrant's critique, we need to make some preliminary remarks on a key concept for our discussion, namely faith, because otherwise we might

[21] See also Musgrave, 1993: 298.

be accused of offering a rather naïve account. Faith is central to theology and to its theological propositions, but it is also notoriously difficult to define. First, in order not to provide an account of faith that is too narrowly focussed on one particular kind of faith, we need to distinguish various locutions of faith, and Robert Audi has provided some helpful insights here. In his *Rationality and Religious Commitment*, Audi suggests that there are at least seven different locutions of faith, namely:

(1) propositional faith – 'faith that'
(2) attitudinal faith – 'faith in'
(3) creedal faith – 'a faith'
(4) global faith – 'being a person of faith'
(5) doxastic faith – 'believing on faith'
(6) acceptant faith – 'accepting people in good faith'
(7) allegiant or loyalty faith – 'faithfulness to'.[22]

With the locutions of Audi in hand, we recognise the multifaceted nature of faith, but this also allows us to focus on one locution in particular, namely propositional faith. Propositional faith is particularly relevant for our discussion here for at least two reasons: propositions form the core of epistemology, but they are also prevalent in Christianity; we could have faith *that* God created the heavens and the earth, *that* Christ died for our sins, or *that* God is three-in-one. Hence, much of the discussion below will be concerned with propositional faith only, whilst also recognising that faith has many layers that fall outside the scope of the discussion below.

Second, we should recognise various attitudes one could have towards faith. A well-known biblical verse is often used to describe our attitude: "Now faith is the assurance of things hoped for, the conviction of things not seen" (Hebr. 11:1). Faith here is defined along the lines of 'assurance', 'hope', and 'conviction' that *p* is true, and we could also add 'confidence' to this list. Yet, there are also voices in Christianity who suggest 'certainty' as an appropriate attitude towards – at least – some of its (propositional) beliefs. For example, the *Catechism of the Catholic Church* defines faith along the lines of certainty by claiming that:

[22] See Audi, 2011: 52-63 for a brief discussion of each locution.

> Faith is certain. It is more certain than all human knowledge because it is founded on the very word of God who cannot lie. To be sure, revealed truths can seem obscure to human reason and experience, but "the certainty that the divine light gives is greater than that which the light of natural reason gives" (Catechism of the Catholic Church, 1994: §157).[23]

Certainty is often understood in terms of entailment, where being certain that *p* is true entails that it is indeed true that *p*. For the authors of the *Catechism of the Catholic Church*, what makes *p* true and certain is its revealed nature. Since *p* has divine origins and God does not lie, *p* has to be true and our belief in *p* is therefore certain. Such a certainty stance, however, is significantly stronger than the alternative suggested by fallibilists, because if S is certain that *p*, then *p* has to be true. As such, if S is certain about *p*, *p* is indubitable for S.[24] For our discussion below, the notion of 'certainty' turns out to be a helpful way of characterising Durrant's attitude towards (some of) the propositions of Christianity, even though Durrant himself does not use the term 'certainty' in criticising critical realism.

3.5.1 Durrant's Argument against Theological Fallibilism

What, then, is the decisive concern Durrant has raised against fallibilism in the context of theology? There is an apparent dilemma, Durrant maintains, between the certainty of Christian faith and the endorsement of fallibilism in theology. As Durrant puts it,

> Commenting on her (i.e. Soskice's) own position as a 'critical realist' she writes (p. 139): 'So the theist may be mistaken in his beliefs about the source and cause of all and assume it to be something of which one can appropriately predicate personalistic terms when one cannot …' This is unacceptable. A being of whom (which) it would be quite inappropriate to predicate personalistic terms would simply not be God; not that, somehow or other, we had got God's nature wrong. After all, Christ himself said: 'He who has seen me has seen the Father'. On Soskice's view presumably Christ himself might have been mistaken as to God's

[23] A reference here is made to Aquinas, which I will also use down below. See Aquinas, 1981 [1920]: II-II.171.5 *ad* 3.
[24] For a very interesting account on the relationship between certainty and human fallibility, see Smith, 2016.

> nature; an untenable position for any Christian theist to entertain (Durrant, 1989: 141).

For Durrant then, while fallibilism claims that we cannot be certain of anything, the Christian theist might point out that faith comes with some form of certainty, i.e. when we see Christ, we have seen the Father indubitably. There is no 'when we see Christ, we *might* have seen the Father and what we have seen is prone to error'. On the contrary, there seems to be a strong certainty here that underpins this theological claim and this certainty is grounded on authority. It is Christ that we see, and through him we have seen the Father, which seems to act as a conclusive justification for our faith. Durrant's stance on this particular line of argument seems to be in line with other voices of the Christian tradition, as discussed above, where some have taught that faith comes with certainty. Thomas Aquinas, for example, maintains that "the certainty that the divine light gives is greater than that which the light of natural reason gives" (Aquinas, 1981 [1920]: II-II.171.5 *ad* 3). Or take John Calvin's claim that "faith is a firm and sure knowledge of the divine favour towards us" (Calvin, 1989: III.II.7). Such an emphasis on certainty clearly contradicts the fallibilism of critical realism, according to which all knowing is considered to be prone to error. Hence, according to these voices, there are certain kinds of theological knowledge that have special epistemological security, and, therefore, fallibilism does not extend to these theological beliefs – this seems to be the core of Durrant's criticism.

Another way of framing Durrant's criticism is in terms of revelation. In revelation, God makes himself known through the person of Jesus Christ. Both Aquinas and Calvin, as quoted above, talk about God revealing himself towards us, and, in this act of revelation, providing firm and certain knowledge about himself. A similar sentiment can be found in John 14:9 ('Whoever has seen me has seen the Father') to which Durrant refers to, according to which we acquire knowledge about the Father by looking at Christ. An important distinction should be made, however, between two kinds of revelation: propositional and non-propositional revelation. Propositional revelation, on the one hand, could be defined along the lines God revealing p to a recipient, say a human being, where p has a particular propositional content. An example of propositional revelation are the verses right before the well-known rock metaphor that characterises the important role of Peter for the wider Christian community, where Peter answers Jesus' question about his identity with the famous

words "You are the Messiah, the Son of the living God" (Mt. 16:16). Jesus then responds as follows: "And Jesus answered him: 'Blessed are you, Simon son of Jonah! For flesh and blood has not reveal this to you, but My Father in heaven" (Mt. 16:17). The propositional content *p* here is Mt. 16:16 that, according to Mt. 16:17, is revealed by God to Peter.[25] Non-propositional revelation, on the other hand, is about God revealing himself through the person of Jesus Christ, which forms the heart of Christianity. For many, non-propositional revelation is more fundamental than proposition revelation, but Menssen and Sullivan suggest that "our epistemic access to revelation comes in very large part through access to the propositional content of revelatory claims recorded in scripture" (Menssen and Sullivan, 2017: 31).[26] Hence, both propositional and non-propositional revelation are significant for Christianity, but how can these, and in particular for our discussion propositional, revelatory claims be considered fallible? Since we understand revelation in terms of God revealing himself to us and, thus, it is considered to be one-directional, the fundamental question then is whether or not God is actually fallible, which is of course – as Durrant puts it – an absurd question to ask.

But how could critical realism respond to this challenge? What Durrant seems to suggest gravitates around the notion of necessary truths, according to which S cannot be in error about *p*, because *p* is true in every possible world. Whereas contingent truths could have been false, e.g. 'although I studied in Edinburgh, I *could have* studied in Oxford', the negation of a necessary truth will necessarily lead to a contradiction, e.g. 'two plus two equals four' is a necessary truth and the statement 'two plus two does not equal four' contradicts the previous mathematical statement. In the case of Durrant's reference to John 14:9, seeing Christ necessarily entails or guarantees true knowledge of the Father, i.e. we cannot be mistaken about *p*, because Christ makes *p* necessarily true in every possible world. Thus, let me reformulate Durrant's argument into an epistemological principle as follows:

> Principle of Theological Certainty: seeing the Father through Christ leads to conclusive and certain beliefs.

[25] Another example of propositional revelation is the seven 'I Am' statements in the Gospel of John, where Jesus describes himself as, for example, the bread of life (John 6:35) or the light of the world (John 8:12).

[26] For a very helpful introduction about the relationship between revelation and epistemology, see Menssen and Sullivan, 2017: 30-45.

Because this principle of theological certainty cannot be false, i.e. there is no evidence against *p*, our beliefs in such a principle cannot be mistaken and, therefore, there are certain theological knowledge claims that should be considered to be infallible. As a result, the 'principle of theological certainty' seems to contradict theological fallibilism.

Before we delve into finding ways that might provide a solution to this particular challenge, it is important to note that there is – as far as I can see – no debate whatsoever in the current literature on critical realism in the science-theology exchange on the challenges posed here for the epistemological position of fallibilism. Therefore, we need to turn to the field of epistemology in order to find possible solutions for the dilemma critical realism seems to face, and various solutions have been offered by epistemologists.[27]

A preliminary and simple solution is to consider fallibilism as only applicable to contingent truths, such as the aforementioned statement 'although I studied in Edinburgh, I *could have* studied in Oxford'. Since contingent truths could turn out to be false, it is rather obvious that contingent truths are fallible, whereas necessary truths cannot be false and, thus, are considered to be infallible. However, as Laurence BonJour and Robin Jeshion have shown, there are good reasons for arguing that *a priori* justification is fallible too in a similar way as *a posteriori,* or empirical justification.[28] Thus, if (some) necessary truths are considered to be fallible too, then fallibilism cannot be restricted to contingent truths only.

We, therefore, need to have a more nuanced solution here. Susan Haack has offered two arguments for supporting her belief that fallibilism also applies to the laws of logic, and, as far as I can see, both arguments are relevant for critical realism in warding off Durrant's criticism.[29]

3.5.2 First Argument: Agent Fallibilism and Proposition (In)fallibilism

First, Haack makes an important distinction between 'agent fallibilism' and 'proposition (in)fallibilism'. According to Haack, the presumed necessity of logical

[27] None of the epistemologists discussed down below have directed their considerations towards Durrant's criticism, but they have grappled with the challenge necessary truths poses for fallibilism more generally. In the following sections, I turn to the work of some of these epistemologists to find possible solutions for critical realism to ward off Durrant's criticism.
[28] See BonJour, 1997; Jeshion, 2000.
[29] In addition to mathematics, logic is, for many, the prime example of necessary truths.

laws, over and against, say, the contingent laws of physics, is based on a significant confusion. As Haack puts it, "it depends on using 'fallible' as a predicate, not of persons, but of propositions: a predicate meaning, presumably, 'possibly false" (Haack, 1978: 234). The fact that there are certain logical, mathematical, or – in the case of Durrant – theological truths that are considered to be necessary is epistemologically uninteresting, because if, say, the laws of logic are indeed necessary, these laws cannot possibly be false and are therefore infallible. However, as Haack maintains, "proposition infallibilism doesn't entail agent infallibilism; even if the laws of logic are not possibly false, this by no means guarantees that we are not liable to hold false logical beliefs" (Haack, 1978: 234). How can this be true? Haack points out that, for example, the logical statement '*p* or *not-p*' might well be necessary, but we might falsely believe that '*p* or *not-p*' is contingent rather than necessary. Or, although '*p* or *not-p*' is necessary, we might falsely argue for 'not-(*p* or *not-p*)'. Hence, even though laws of logic may well be necessary, we could still believe in falsehoods. If this possibility of being mistaken always looms over us, then we cannot claim to have infallible knowledge, even about the surest laws of logic. The predicate 'fallible' should therefore be applied to persons instead of propositions.

A helpful way to understand Haack's distinction between 'agent fallibilism' and 'proposition (in)fallibilism' is to turn to the work of the theologian John Henry Newman and his interpretation of the distinction between 'certitude' and 'certainty'. Where certitude is generally understood as being applicable to both the mental state of having certainty and the certainty of propositions, Newman ascribes certitude only to mental states. As Newman puts it, "certitude is a mental state: certainty is a quality of propositions. Those propositions I call certain, which are such that I am certain of them" (Newman, [1870] 2010: 337). Certitude, then, refers to our mental state of being conclusively convinced in *p*'s truth, whereas certainty here has a more objective foundation because propositional certainty is either true or false. How is this helpful for understanding Haack's distinction? Similar to Haack, Newman makes a distinction between agents (or mental states) and propositions. Haack's notion of 'agent fallibilism' could be understood in terms of Newman's understanding of certitude, while Newman's certainty represents Haack's 'proposition (in)fallibilism. Whilst certainty on the level of propositions seems to be possible for Haack, disagreements between Newman and Haack emerge regarding the epistemological quality of certitude. For Newman, our mental states may well be infallible, whereas for Haack

such a possibility is impossible. We, for example, could believe in falsehoods or be unware of the necessity of *p*, and, thus, Haack denies the existence of infallible certitude, but she maintains the possibility of Newman's certainty as a quality of propositions. There may well be certain necessary theological truths, but the existence of such truths does not guarantee certitude.

Others have suggested a similar proposal in making 'fallible' a predicate for persons rather than propositions. Leonard Carrier, for example, defines fallibilism along the lines of "not knowing that one is not mistaken in believing that p" (Carrier, 1993: 370).[30] Underpinning this definition is a separation between, on the one hand, the fallible human mind and, on the other hand, the contingent and necessary propositions. Our knowledge claims are fallible *because* they are held by our fallible minds, and it is us who are considered fallible. Even if we can have infallible knowledge about the Father by looking at Christ, the fact that we therefore cannot be mistaken might be something that we do not know. How can this be true? For Carrier, we are never in a position to be sure that we have eliminated all our logical errors, even in the case of mathematical reasoning, because the human mind remains fallible. As such, the objective certainty of *p*'s truth needs not coincide with our subjective state of having certainty, and, as a result, our knowledge claims remain fallible.

How, then, could we apply this first solution to Durrant's criticism? Haack's approach allows us to make a distinction between 'propositional (in)fallibilism' and 'agent fallibilism', or in terms of Newman's distinction between 'agent certitude' and 'propositional certainty'. If we understand John 14:9, and I think we should, in terms of being a proposition, then we can weaken Durrant's criticism. With Haack's solution in hand, critical realists could actually agree with Durrant, and Newman, that – on the level of propositions – there are indeed infallible theological propositions, but also defend their endorsement of fallibilism by referring to Haack's 'agent fallibilism' and, thus, reject the possibility of Newman's 'agent certitude'. Durrant's 'principle of theological certainty' might indeed be a necessary truth, and the resulting theological propositions might share this necessity, but the fact remains that it is *we who* look at the Father through Christ and we cannot move beyond our fallible nature and sight. We could, for example, falsely believe that Durrant's 'principle of theological certainty' is contingent, rather than necessary. Since the possibility of being mistaken

[30] See also Carrier, 1993: 361.

always looms over us, Newman's idea of infallible certitude or Durrant's allusion to infallible knowledge seems to be mistaken on the level of agents. As a result, even our knowledge claims about the surest theories and doctrines are still considered to be fallible.

Furthermore, we could couch 'agent fallibilism' in terms more akin to theology. First, we could refer to our sinful nature that prohibits us from seeing God and, as such, has distorted our image of God, as a means to reformulate 'agent fallibilism' in a theological context. We could hold false beliefs about God, because sin prevents us from formulating conclusive beliefs about God. Quite apart from the question of whether or not we can have infallible knowledge of the Father by looking at the Son, this notion of sin raises the question of whether we are actually able to look at Christ infallibly. If our theological sight is considered to be fallible, due to our sinful nature, in the first place, then this state of affairs adds another layer of potential fallibility. Second, we could, for example, contradict Durrant's reference to John 14:9 by referring to Exodus 33:20,[31] John 5:37,[32] or 1 Timothy 6:16.[33] Due to our status as creatures, we can never fully comprehend the Divine, and, as such, God remains – at least in part – unknowable to us. Hence, even if there are theological necessary truths, and John 14:9 and the Christian tradition seem to suggest such a possibility, knowledge remains fallible, because we are still capable of *believing in* theological falsehoods. Such a stance allows critical realists to maintain their fallibilist position but simultaneously to recognise the possibility of infallible and certain theological propositions. If the above argument holds true, then critical realists seem to be able to weaken Durrant's criticism by using Haack's first argument, but is there also another way to cast doubt on Durrant's argument? For that, we need to turn to Haack's second argument that might be helpful for critical realists to ward off Durrant's criticism.

3.5.3 Second Argument: Argument of Plurality

Second, Haack suggests an 'argument of plurality' for warranting her claim that the predicate 'fallible' should be applied to persons rather than propositions. Underpinning this argument is the claim that there exists a plethora of beliefs about

[31] Exodus 33:20 reads: 'But', he said, 'you cannot see my face; for no one shall see me and live'.
[32] John 5:37 reads: And the Father who sent me has himself testified on my behalf. You have never heard his voice or seen his form.
[33] 1 Timothy 6:16 reads: It is he alone who has immortality and dwells in unapproachable light, whom no one has ever seen or can see; to him be honour and eternal dominion. Amen.

the physical world that we once considered to be true, but which have turned out to be false; an argument also used by critical realists. As Haack puts it in the context of logic, "the very plurality of logical systems speaks against our possession of any infallible capacity to ascertain the truths of logic" (Haack, 1978: 235). It would be rather naïve to assume a univocal understanding of the laws of logic, Haack maintains, as if there are no new discoveries in logic. Such a confidence in logic as a completed science has been disproved by the significant advances in logic from the end of the nineteenth century onwards. Logic is not unalterable. On the contrary, there are continuous developments in this branch of philosophy, with different schools of thought.

This 'argument of plurality' also operates in the context of theology, where a univocal reading of a particular biblical verse or a general endorsement of a certain theological doctrine is far from obvious. First and foremost, there are numerous theological disagreements that have led to significant schisms within the Christian tradition, each endorsing a particular proposition or belief and rejecting others. Famous examples here are the endeavours of the church to reject Docetism, according to which Christ did not have a real human body, or Arianism, which rejected the fully divine status of Christ. But the mere existence of such traditions rejects the possibility of a univocal reading of, say, John 14:9, because if we endorse Arianism, we are unlikely to maintain the traditional orthodox reading of this verse as a claim about the divinity of Christ. Presumably, Arians felt that their understanding of Christ was consistent with this verse, even if orthodox Christians disagreed. We could of course provide arguments against Arianism, but the fact that it exists – and with Arianism many other 'unorthodox' doctrines and orthodox doctrines that diverge on biblical interpretation of key revelatory texts – seems to weaken Durrant's case against theological fallibilism.

This inability to have a univocal reading of Scripture echoes a very current and relevant debate on theologies of Scripture; a very productive approach in biblical hermeneutics.[34] John Webster defines a theological reading of Scripture as follows: "theological interpretation of Scripture is interpretation informed by a theological description of the nature of the biblical writings and their reception, setting them in the

[34] See e.g. Watson, 1994; Fowl, 1997; Webster, 2003; Vanhoozer, 2005; Billings, 2010; Volf, 2010. Furthermore, *International Journal of Systematic Theology* vol. 12, no. 2 (2010) is a dedicated volume to the theological interpretation of Scripture

scope of the progress of the saving divine Word through time" (Webster, 2010: 116). Important for the theological interpretation of Scripture – at least to some of its adherents – is the recognition that there is no theory-free engagement with Scripture. When reading Scripture, we are never in a 'neutral' position because we read Scripture in light of our experiences, expectations, and presuppositions. As Spinks puts it in his definition: "*theological interpretations are those readings of biblical texts that consciously seek to do justice to the perceived theological nature of the texts and embrace the influence of theology (corporate and personal; past and present) upon the interpreter's enquiry, context, and method*" (Spinks, 2007: 7).[35] No reader, according to Spinks, can actually escape theological and sociological factors influencing our reading of Scripture. As such, interpretation is always involved in our engagement with the biblical text.

How, then, is this relevant to our discussion of Durrant and Haack? Durrant seems to presuppose a rather strong – or one could say 'naïve' – reading of Scripture. For Durrant, fallibilism is an untenable position to hold because we somehow have immediate access to God's nature. To warrant this claim, Durrant simply refers to John 14:9, pointing out that we could know God's nature through Christ. But first, it is clear that this is Durrant's interpretation, since the verse does not actually say this, literally speaking. Second, as discussed above, the theological interpretation of Scripture recognises the significant role of the reader, who brings his or her own expectations and presuppositions to the biblical text. There is no 'theory-neutral' reading. If we apply this to John 14:9, God may well have revealed something infallible to his disciples and particularly Philip in John 14:9, but we have to question whether or not the disciples interpreted this particular revelation correctly, and how we then interpret their interpretation of that revelation. Hence, whilst God reveals himself through *p*, *p* itself is still the result of interpreting revelation in our 'natural language' and using human terms. Referring to the argument of Haack, then, we should recognise the fallibility of human agents interpreting divine revelation, despite the fact that the propositional content of that revelation might actually be infallible.

Furthermore, similar to the laws of logic, recent developments within theology show that theology is far from completed. Cultural developments, developments in

[35] Italics: Spinks. See also Fowl, 1997: xii, where he claims that "I take the theological interpretation of Scripture to be the practice whereby theological concerns and interest inform and are informed by a reading of Scripture".

economics, or even scientific developments have created an – as the Germans would say – 'Umwelt' that have sparked new research in theology. Examples here are plentiful: liberation theology, John Milbank's radical orthodoxy, the recent turn to Trinitarian theology, and – I would argue – developments in the science-theology exchange. In the process of engaging with these developments, theologians are challenged to reformulate their beliefs and, at least in some cases, reject previously held beliefs. Whilst certain doctrines may well be infallible, there is no conclusive and infallible set of doctrines that are univocally endorsed amongst Christian believers, because such divisions amongst doctrines are human made and all human beings are subjected to 'agent fallibilism'. Hence, to assume a univocal endorsement of a particular theological doctrine can be disproved by looking at the numerous debates within the rich tradition of Christianity.

Finally, this 'argument of plurality' also attacks another element of Durrant's critical rejection of theological fallibilism, which gravitates around the notion of self-evidence; an argument also found in Haack against the idea of infallible logic. Durrant seems to assume a certain level of self-evidence, which becomes clear in the claim that "on Soskice's view presumably Christ himself might have been mistaken as to God's nature; an untenable position for any Christian theist to entertain (Durrant, 1989: 141). Self-evidence could be defined along the lines of *p* being obviously true. In Durrant's claim, the apparent absurdity of Christ being mistaken about God's nature is indeed widely supported in the Christian tradition, and, thus, his argument seems to be rather obvious. How could the Son of God be mistaken about the nature of his Father? However, Haack maintains that self-evidence is no guarantee for *p*'s truth. Whilst Durrant's 'principle of theological certainty', and particularly the resulting claim that it is indeed rather absurd to claim that Christ himself is mistaken about the nature of God, might sound obvious, this fact does not guarantee that the principle is true. With the 'argument of plurality' in hand, Haack points out that "different people, and different ages, find different and even incompatible propositions – that some men are naturally slaves, that all men are equal – 'obvious'" (Haack, 1978: 236). There is, therefore, no vantage point that allows us to conclusively define what is considered to be 'obvious' or self-evident and what is not. If this is true, then Durrant's appeal to self-evidence as a way to warrant his criticism against theological fallibilism seems to falter, because self-evidence does not guarantee the truth of *p*.

Therefore, whilst Durrant's criticism seems to make a strong case against theological fallibilism, I have tried to soften the blow by using Haack's two reasons for extending fallibilism to the laws of logic. First, and foremost, Haack suggests that we need to make a distinction between 'fallible persons' and '(in)fallible propositions'. Even if a proposition is infallible, then such a state of affairs does not guarantee agent infallibilism. Human beings are always liable to error and we can couch this state of affairs in language akin to theology, e.g. by introducing the notion of sin or using biblical verses. Second, whilst Durrant seems to assume a kind of univocal acceptance of certain beliefs, Haack's 'argument of plurality' can be used to challenge Durrant's claim. Christian history is full of theological disagreements and resulting church schisms, which can be used to weaken the idea of theological infallibilism. Hence, whilst there may well appear to be infallible propositions, even on the level of theology, there is always the *possibility* of being in error, because the agent remains fallible. Haack has provided some helpful, albeit not conclusive, arguments to weaken Durrant's criticism for now and to allow critical realists to endorse the notion of fallibilism in the context of theology.

3.6 Concluding Remarks: Epistemological Humility

As discussed above, there is a surprisingly common theme that all critical realists seem to endorse the notion of fallibilism as the most appropriate epistemological stance, according to which absolute certain and true knowledge is unattainable. All knowledge is prone to error, critical realists maintain, even the surest theories of science. As Polkinghorne puts it in the context of science, "science yields well-motivated beliefs, but it does not deliver complete and absolute certainty about them" (Polkinghorne, 2011: 11). Yet, this does not lead to the sceptical inference that it is impossible to have any knowledge at all. Polkinghorne suggests that

> We must resist "total account" theories of knowledge and be prepared instead to value more piecemeal achievements. By that I mean that we do not need to be right (or agree) about everything in order to be right (or agree) about some things. Revisions and precisions of detail should not be regarded as producing sharp discontinuities in understanding, where what is involved is clearly interpretable as a refinement of our knowledge of the nature of a common referent. J. J. Thomson pictured the electrons he discovered as being little hard

> lumps of matter, tiny charged 'currants' in the atomic 'pudding'. I regard them as excitations in the quantum field of the electron. Yet we are clearly talking about the same entity (the light negatively charged constituent of atoms), and our descriptions differ only because the advance of knowledge has enabled me to share in a more exact (but not necessarily exhaustive) description (Polkinghorne, 1998: 105).

Whilst recognising the limitations of our epistemic capabilities and the inconclusiveness of our justifications, for critical realists acquiring knowledge is still possible; what is more, it is possible to acquire knowledge in a reliable way as long as S's belief in *p* has withstood serious criticism. This then leads to a redefinition of the classical account of propositional knowledge. Some critical realists maintain that it is more reasonable to accept this belief or theory in light of *j*, where the constituents of *j* have withstood serious criticism.

Why then is this notion of epistemological fallibilism central to critical realism? The critical realist's endorsement of fallibilism should be understood as a rejection of epistemic hubris, which is often assumed in the more naïve accounts of science or theology. Adherents of both traditions consider their approach as the only valid 'avenue' to truth and share an optimistic belief in the capabilities of their respective tradition to provide a complete and true description of reality, i.e. infallibilism. As discussed above, critical realists are sceptical regarding the epistemic capabilities of both the scientists as well as the theologians. Even the surest theories of science have been repeatedly proven to be false or non-referring. As an alternative to the hubristic position of naïve realism, critical realism suggests a more humble position towards our epistemological capabilities; a position called 'epistemic humility', according to which humility is an epistemic virtue that an epistemically responsible person would want to have.[36] Rather than having a certain improper arrogance or optimism regarding our epistemological capabilities, critical realists consider a certain sensitivity towards our epistemic failings as fundamental. Critical realists are aware of our intellectual limitations, as there is always the possibility of being in error.[37] Hence, the endorsement of critical realism is not only an epistemological thesis, but also an

[36] For epistemic humility, see Roberts and Wood, 2003; *idem*, 2007; Church and Samuelson, 2016; Whitcomb (et al.), 2017.
[37] See Whitcomb (et al.), 2017: 511.

epistemological recommendation, according to which we should always be open to revising our beliefs in the light of new evidence.

Furthermore, fallibilism and the resulting epistemic humility are central for critical realism, because this creates a certain openness to there being more 'avenues' to the approximate truth. Whereas, say, New Atheism prides itself in arguing that science is the only avenue to real and objective knowledge, for critical realists such as Polkinghorne, "there is no single epistemology" (Polkinghorne, 2011: 17). There are various roads to acquiring fallible knowledge, each having their own criteria, aims, and sources. Standards are considered to be relative to each epistemological avenue, and, as such, science cannot dictate the criteria and sources of, say, the study of arts. Whilst science might ground its knowledge by observing particular phenomena in nature, theologians could for example rely upon written and spoken narratives of God revealing himself to Christian communities. Such a stance is fundamental to their central aim of establishing their Christian worldview that is sympathetic to the sciences. But before we can delve into exploring the underlying mechanisms of such a scientifically-sympathetic Christian worldview that critical realism envisions, we first need to sustain the argument by carefully examining their views on semantics (Chapter 4), philosophy of science (Chapters 5 and 6) and theology (Chapter 7).

CHAPTER 4

MODELS, SYMBOLS, AND ANALOGIES

Critical Realism and its Semantic Stance

This chapter aims to shed light on the nuanced considerations of critical realism regarding their views on semantics. After discussing the metaphysical and epistemological commitments of critical realism in the previous two chapters, we have now come to the third stance of our taxonomy of critical realism. As we have discussed in Chapter 1 'The Evolution of Critical Realism', we have defined the semantic stance of critical realism as follows:[1]

> the critical realist semantic stance gravitates around the principle to take our theories and models 'seriously, but not literally'. Resulting from their fallibilistic epistemology, our language can never fully or infallibly describe the objects to which it refers. We should recognise the epistemological limitations of the human mind, and, as a result, our linguistic concepts only partially represent certain aspects of reality.

Embedded in their endorsement of epistemological fallibilism, critical realism claims that our language – even the surest theories of science – can never fully describe the object to which it refers, because there is always the possibility of being in error. Our language only offers an inadequate and partial picture of specific aspects of reality.

In this chapter, then, we will unpack our definition of the semantic commitments of critical realism. After some introductory remarks (Section 4.1), a brief overview of two alternative positions will be provided as a framework to understand the *via media* of critical realism, namely the endorsement of literalism amongst naïve realists, and those who endorse instrumentalism (Section 4.2). Critical realists aim to establish a middle ground between these two positions, emphasising the roots of models and theories in human imagination, whilst maintaining that models and theories, albeit partially and inadequately, represent reality. Exploring this middle ground will lead to an attempt to disentangle the various views amongst critical realists with regard to the

[1] See p 44ff.

nature of analogies, models, metaphors, and theories (Section 4.3). As it turns out, there are clear differences between critical realists and here we will use the already introduced notion of 'family resemblance' to understand these differences. But, despite the differences, there remains a challenge for all critical realists to explain how our linguistic concepts are considered to be fallible but nonetheless referring. We will probe a bit deeper into this challenge by discussing Soskice's elaboration and Durrant's criticism of Soskice's argument (Section 4.4). Finally, a number of concluding remarks will be offered that allow us to set out and explore the fourth, i.e. methodological, principle of our taxonomy of critical realism, where philosophy of science is considered to be helpful for understanding theology and its methodology (Section 4.5).

4.1 Critical Realism and Semantics

From the emergence of critical realism in the science-theology exchange from 1966 onwards, issues concerning semantics and metaphors have always been significant to critical realism. Such a turn to semantics in the literature of critical realism is understandable. From the beginning of the twentieth century, philosophy, especially in the English-speaking world, has become explicitly concerned with the study of language. It is language as a system of signs that allows us to talk, describe, explain and refer to external reality and its state of affairs. Language offers us a way to communicate our (fallible) ideas, models and theories that somehow seem to be related to reality out there. Semantics here deals with the construction of language in the form of theories, models, analogies, and metaphors and how these concepts tell us something about the scheme-independent reality.

Critical realists have spent a significant amount of effort elaborating how to define this relationship between language, epistemological considerations and external reality, providing a nuanced and multi-faceted account of their semantic stance. On the level of semantics, critical realists have criticised naïve realism, according to which our language literally and exhaustively describes reality, and instrumentalism, according to which our language is nothing more than mere instruments that allow us to negotiate a reality that we cannot describe in itself. For critical realists, our semantic products should be understood in terms of taking them 'seriously, but not literally'. Our language can never fully or infallibly describe the objects to which it refers. As such, we should recognise the epistemological limitations of the human mind, and, as

a result, our language offers an inadequate and partial picture of specific aspects of reality. Such a position should be understood in the context of the previous two chapters on metaphysics and epistemology. Against naïve realism, critical realism emphasises the scheme-dependent nature of our knowledge claims. Knowledge does not simply mirror reality-in-itself, because our engagement with reality is always mediated by a particular conceptual framework. Due to this state of affairs, all knowledge is considered to be prone to error. Infallible and conclusive knowledge is impossible, critical realists maintain. As will be discussed in this chapter, these considerations are fundamental for understanding the semantics of critical realism, where our linguistic concepts are understood in terms of their "revisability in seeking to explore a world only partially and imperfectly understood – and whose ultimate reality is bound to be elusive since we ourselves are structures in the selfsame world we study" (Peacocke, 1993: 14).

However, whilst the above summary of the semantic stance of critical realism seems to suggest a rather straightforward narrative, in which all critical realists share the same semantic commitments, there are interesting differences amongst critical realists regarding their views of semantics. Whilst he agrees with the other critical realists about the limitations of our language to fully define the object to which it refers, it has been in particular Polkinghorne who takes a different stance on several semantic issues, such as the usage of metaphors in science and whether or not models have ontological pretentions. As such, the already introduced notion of 'family resemblance' becomes very helpful in this chapter for explaining these differences amongst critical realists. As discussed in Chapter 1 'The Evolution of Critical Realism', the notion of family resemblance allows us to recognise the differences between critical realists, but there are still enough salient resemblances or commonalities to consider critical realism as resembling a family.[2] We will use this notion of family resemblance to better understand the semantic differences, but at the same time it allows us to use 'critical realism' as an umbrella under which these different semantic views fall.

But before we probe a bit deeper into the semantics of critical realism and analyse the differences between critical realists on the level of semantics, let us first explore two opposing schools of thought, namely literalism and instrumentalism.

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[2] See p. 24ff.

4.2 Critical Realism and its Foes: Literalism and Instrumentalism

A closer look at two rather opposing positions regarding semantics provides a helpful structure for understanding the elaborations of critical realism on their views on semantics: literalism and instrumentalism.[3] First, literalism considers models and theories to be exact representations or even replicas of reality; a position often associated with naïve realism.[4] As Barbour puts it,

> science was assumed to provide *a literal description* of an objective world. Its concepts were thought of as exact and complete replicas of nature as it is in itself – a view we now call 'naïve realism'. There was assumed to be a one-to-one isomorphic correspondence between every feature of a theory and a matching feature of the entity it reproduced or 'mirrored' (Barbour, 1966b: 157).

Explaining subatomic particles as 'waves' or 'particles' really means, according to this stance, that electrons have these properties of both particles and waves. Or, in the context of theology, describing God in more anthropomorphic terms really means that God has such properties. Adherents of literalism consider linguistic concepts as – to use the previous reference to Barbour – "exact and complete replicas of nature as it is in itself", which is grounded in the belief that there is a direct correspondence between the object and the concepts (Barbour, 1966b: 157). According to this reading, models function as a mirror, matching every feature of the object with the relevant features of the applied model, which leads to a precise and unambiguous explanation of the object itself.

Against such a literalist stance, critical realists have developed a number of arguments. First and foremost, such a literal description, critical realists argue, is untenable, due to the inability of the human mind to fully comprehend both the physical and divine reality. According to van Kooten Niekerk, metaphors and models should not be considered as "precise descriptions of the entities, structures, relations, and processes they intend to illuminate" (van Kooten Niekerk, 1998: 61). As discussed

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[3] See Barbour, 1997: 117.

[4] Literalism is generally understood in philosophy of semantics as being concerned with truth and truth-conditions, i.e. capable of being true or false. If a theory, for example, states that a particular entity exists, then that entity really populates the world. Critical realists, however, interpret this notion of 'literalism' in a particular way, according to which literalism is understood as a synonym for an exhaustive and precise description of reality. See Psillos, 1999: xx; Barbour, 1966b: 157; Peacocke, 1984: 32.

in Chapter 2 'The Mind-Independence of What?', where we explored the metaphysical stance of critical realism, all knowledge claims are scheme-dependent.[5] As a consequence, our knowledge claims about reality are essentially fallible and this also applies to language, models, and theories. As Peacocke puts it, "the use of complementary models in science, notably in atomic physics, is a forceful reminder that models, however useful, are never literal; thus each has a certain inadequacy, a situation that refutes any *naïve* realism" (Peacocke, 1984: 32).[6] Hence, because there is no direct mirroring of reality, due to the scheme-dependent nature of our linguistic concepts, theories provide only a partial and fallible description of reality.

Furthermore, Barbour, amongst others, maintains that a naïve understanding of models pushes the analogical nature of models too far, disregarding the differences between the analogy and the emerging and novel situation to which the analogy is applied. An example of this, Barbour suggests, is the analogy between sound waves and light waves, which "led to the erroneous assumption that light, like sound, must be transmitted through a medium (the hypothetical 'aether')" (Barbour, 1974: 35). This also applies to the theological discipline. Only a handful of theologians might subscribe to such an anthropomorphic theology, where human characteristics are understood as literally describing God. As Soskice puts it, "there are few true literalists who believe that mention in the Bible of God's 'mighty arm' means that God has physical limbs" (Soskice, 1988: 175). Therefore, such a literalist reading of our linguistic concepts seems to be a position too strong to defend.

Second, on the other end of the spectrum, critical realists, such as Barbour and Peacocke, explicitly reject those who view theories as mere useful fictions. According to this view, which Barbour ascribes to the instrumentalist stance, scientific theories and religious models are understood as a "mental construct used instrumentally for particular purposes but not assumed to be either true or false" (Barbour, 1974: 38). Our linguistic concepts are mere instruments for prediction and observation and these concepts do not depict reality in any way. Utility becomes the hallmark of the sentence's validity and a theory is considered to be a heuristic tool, rather than in terms of its ability to represent reality. Models and theories lack assertoric content in that models do not state how things really are in reality, due to the absence of truth-conditions, but are understood as mere useful tools to explain phenomena. As a

[5] See p. 66ff.
[6] Italics: Peacocke.

consequence of this emphasis on utility rather than truth, models and theories seem to have an expiry date.

Like the literalist stance, instrumentalism is also considered to be questionable. Barbour, for instance, explicitly rejects the instrumentalist stance, arguing that the linguistic concepts produced by scientists and theologians do represent reality, albeit inadequately. As Barbour puts it, "like the naïve realist (and unlike the instrumentalist), the critical realist takes theories to be representations of the world. He holds that valid theories are true as well as useful" (Barbour, 1974: 37).[7] Since the linguistic concepts have ontological pretentions, their truth is grounded on their agreement with the objective features of reality. As a consequence, the instrumentalist's argument that models and theories should be considered as devoid of any ontological content is incompatible with the views of Barbour and others, because models and theories really aim to depict reality and its furniture; what is more, for a theory or model to hold is to agree with reality and its furniture.

For critical realism, therefore, knowledge claims that a model implies can be determined true or false by its correspondence with reality; a fundamental attitude amongst critical realists and their views on semantics. According to such a correspondence theory, truth of a proposition, a model, or even a metaphor can be determined by its correspondence with the mind-independent reality. Such a basic correspondence theory of truth assumes that for any proposition *p*, *p* is true if and only if *p* corresponds to how things are in reality. The sentence 'snow is white', for example, is true if and only if the proposition corresponds to the objective features in the world, i.e. white snow. This statement is *not* saying that 'snow is white if and only if snow is white', because that would be a mere tautology. On the contrary, a correspondence theory is about the truth of the proposition 'snow is white', and to determine its truth, some form of correspondence should obtain between 'snow is white' and objective features of the physical world, i.e. there really are objects out there that we call 'snow' and that have the property of 'being white'. Truth is, thus, considered to be relational, assuming *p*'s truth consists in some corresponding connection with the external reality to which *p* refers, and it is the external reality that renders propositions about this reality as either true or false. Critical realists tend to adopt the notion of correspondence as a significant determinant in considering as to whether models and

[7] See also van Kooten Niekerk, 1998: 61-62.

theories are truth. Barbour, for example, asserts that "the *meaning* of truth is correspondence with reality" (Barbour, 1997: 110).[8] Whilst literalism also endorses such a correspondence theory of truth, it is incompatible with instrumentalism.[9]

Thus, critical realism rejects both literalism and instrumentalism on various grounds. A helpful summary of the various arguments here is offered by Barbour, who argues that

> Like the naïve realist (and unlike the instrumentalist), the critical realist takes theories to be representations of the world. He holds that valid theories are true as well as useful. To him, science is discovery and exploration as well as construction and invention. The scientist, he insists, seeks to understand and not just predict or control. Unlike the naïve realist, however, the critical realist (along with the instrumentalist) recognizes the importance of human imagination

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[8] Italics: Barbour. See also Southgate and Poole, 2011: 16-17.

A similar approach has been taken by Ted Peters and Carl Peterson, who endorse a correspondence view as well. However, for Peters and Peterson, a mere correspondence theory of truth is not sufficient to explain how to determine the truth of models and theories. Referring to the work of Nancy Murphey, Peters and Peterson want to complement the correspondence theory of truth with a coherentist's view, where empirical adequacy is strengthened with internal coherence amongst relevant theories and models. The main reason for their position is that, Peters and Peterson maintain, such a correspondence understanding is presumed by both naïve realism and foundationalism, and Peters and Peterson are rather critical towards both positions for various reasons.

However, Peters and Peterson's alternative sounds rather ambiguous. Usually, one either endorses a correspondence theory, i.e. 'snow is white' is true if and only if snow is white, or a coherence theory of truth, i.e. 'snow is white' is true if and only if the propositional content of 'snow is white' is coherent with other propositional contents expressed by other sentences in the system of knowledge in question. First and foremost, coherence and correspondence are traditionally considered to be opposing theories, rather than complementing views. Whilst a coherence view explains the relationship between theories and propositions and their truth in terms of coherence with other theories and propositions, i.e. its truth condition lies in other propositions, correspondence theories emphasise the objective features of the world as significant in determining this relationship. Hence, if the truth of the proposition 'snow is white' is already established via correspondence, then its coherence with other propositions of the system of knowledge is rather redundant and unnecessary. Furthermore, since Peters and Peterson endorse a realist stance, an endorsement of correspondence would be more appropriate for the mere reason that such a view seems to be much more straightforward than coherentism, because all it asks for a proposition to be true is to 'pair up' – as it were – with the relevant object rather than with propositional content. Therefore, Peters and Peterson's straddle between correspondence and coherence sounds philosophically unsound and unwarranted. See Peters and Peterson, 2013: 197, 204. For Murphey, see Murphey, 1993: 354.

[9] Often endorsed by anti-realists, the coherentist's theory of truth provides an alternative to the idea of truth as correspondence, according to which *p*'s truth should be grounded on the relationship or cohere with other propositions of the system of knowledge in question. According to this coherentist's view of truth, a proposition is true if and only if it coheres with a set of other propositions. The aforementioned proposition 'snow is white' is true if and only if it coheres with, for example, other propositions that have been accepted as true, such as 'I am not visually impaired', or 'snow is not non-white'. Rather than asserting that *p* is made true or false by the way things are in the external reality, coherentists argue that it is a matter of *p*'s relation to other relevant propositions. Hence, the truth of models, propositions and theories arises out of other relevant propositions

> in the formation of theories. He acknowledges the incomplete and selective character of scientific theories (Barbour, 1974: 37).

But if both literalism and instrumentalism fail to provide a judicious account of semantics, what then is the alternative of critical realism? In the next section, we will probe a bit deeper into the *via media* between literalism and instrumentalism that critical realism seems to envision.

4.3 Critical Realism and its Semantic *Via Media*

Against instrumentalism and the literalist stance of naïve realism, critical realists intend to provide a more sophisticated alternative that emphasises the linguistic concept's origins in the human mind, whilst, at the same time, claiming that the linguistic construct refers to and represents (albeit inadequately) parts of reality. As such, our linguistic concepts are considered to be scheme-dependent devices for depicting scheme-independent reality; a theme explored in Chapter 2 'The Mind-Independence of What?'.[10] Another pivotal element of the critical realist stance on semantics is the recognition of the inadequacy of our linguistic concepts to portray reality exhaustively. Against the critical realist's construal of literalism, where models are understood as describing reality exhaustively and conclusively, critical realism takes a fallibilist stance which recognises the limitations of our epistemological capabilities. Even the surest theories of science and the best doctrines of theology are prone to error in this view; a theme discussed in Chapter 3 'Critical Realism and Epistemology'.[11] Barbour provides a useful summary of the critical realist stance on semantics which brings together both arguments, according to which

> models and theories are abstract symbol systems, which inadequately and selectively represent particular aspects of the world for specific purposes. This view preserves the scientist's realistic intent while recognizing that models and theories are imaginative human constructs. Models, on this reading, are taken to be seriously but not literally; they are neither literal pictures nor useful fictions but limited and inadequate ways of imagining what is not observable. They make

[10] See p. 66ff.
[11] See p. 84ff.

> tentative ontological claims that there are entities in the world something like those postulated in the models (Barbour, 1997: 117).

Hence, models provide a symbolic and inadequate representation of reality and its furniture, and they should be taken as 'seriously, but not literally' – to use an oft-quoted phrase in the science-and-theology literature.[12] Or, as Peacocke puts it,

> In both science and theology, the models are 'candidates for reality' that are reformable and are as close as we can get to speaking accurately of reality: they are not literal pictures, but they are more than useful fictions. They are both representations, for particular purposes, of aspects of reality that are not directly accessible to us. They reflect reality and are to be taken seriously but not literally. They are partial and inadequate – and as good as we can have for the time being (Peacocke, 1984: 41-42).

Whereas literalism, as construed by critical realists, holds a rather naïve account of models and theories, where a theory or model becomes a permanent part of our knowledge as soon as it holds true, critical realism suggests a more nuanced stance here. Our linguistic concepts that originate in the human mind only partially depict the scheme-independent reality.

Due to our ability to only partially depict reality, our language is considered to have what van Kooten Niekerk calls 'semantic flexibility', according to which semantic concepts represent reality with varying degrees of precision.[13] We could, for example, use different stories to describe the same phenomenon, where each story captures the phenomenon in general terms but it varies with regard to the level of precision. For example, when I arrive late at an appointment, I could either tell my colleagues that 'there was an accident on the M8 to Edinburgh, which caused a traffic jam' or I could simply say that 'the traffic was horrendous'. Both stories provide the same reason for the fact that I ran late, but the former is more precise than the latter.

Hence, critical realism maintains that our models and theories do not exhaustively describe reality. There is always the possibility of being in error and our linguistic concepts are therefore considered to be provisional. Nevertheless, our linguistic

[12] See Barbour, 1974: 38. See also Peacocke, 1984: 42; Peters and Peterson, 2013: 187.
[13] See van Kooten Niekerk, 1998: 60-61.

concepts do refer to and aim to represent the scheme-independent reality. Theories and models are more than useful tools because their hallmark of truth is the ability to represent reality. But we need to probe a bit deeper into the various semantic considerations of critical realism by analysing four key concepts: analogies, models, metaphors, and theories.

4.3.1 Analogies: Making the Unfamiliar Familiar

Underpinning all of critical realism's considerations of both scientific and religious models, theories, and metaphors is the notion of inadequacy. Our language does not provide precise descriptions of reality. Rather than providing an exhaustive representation of reality-in-itself, these linguistic concepts are fundamentally fallible, providing provisional and partial candidates for reality. Due to the partial hiddenness of reality and the inability of the human mind to fully grasp its objects, a direct correspondence between object and model, theory, or metaphor is considered to be impossible. This conclusion leads critical realists to introduce the notion of 'analogy' to explain the rather complex relationship between objects and our linguistic concepts.

Rather than mirroring its objects or defining this relationship as 'identical', models and theories provide an abstracted analogy to the objects they intend to portray. As Barbour puts it, "an analogy is never a total identity or a comprehensive description, but only a simplified comparison of limited aspects" (Barbour, 1966b: 161). Analogies emphasise apparent similarities between two or more phenomena, where a familiar phenomenon is used to understand or describe a currently unknown phenomenon. In Barbour's terms: "two entities are defined as similar if some of their characteristics are the same and others are different; the similarity may be one of form, function, or property" (Barbour, 1966b: 158). Or, as Soskice puts it,

> Analogy as a linguistic device deals with language that has been stretched to fit new applications, yet fits the new situation without generating for the native speaker any imaginative strain. This can best be shown by example: suppose that one encountered intelligent life on another planet (in philosophers' examples this is always Mars), life that communicated by means of the arrangement of fibres on its body. If we were able to interpret this new mode of communication, even though it involved no sounds at all, we should quite naturally say that the Martian 'told' us such and such, or made this or that 'comment'. We could probably not

> regard this as speaking metaphorically; more likely we would regard it as justified extensions of what 'told' and 'comment' really mean. This would be not a metaphorical but a 'stretched' or analogical use of language (Soskice, 1985: 64).

Instead of expanding into a new picture, analogies merely stretch the familiar, such as stretching human terms, e.g. infinity, love, and power, to describe God. As such, analogies provide relationships between the realm of human symbols, expressed in models, theories, and metaphors, and reality 'out there' to which these symbols intend to refer.

What makes analogies important to scientific and theological practice is their clarifying power in offering a certain level of familiarity. In the case of science, a successful analogy provides a framework familiar to the scientists, allowing them to explore a currently unexplained phenomenon on the basis of current hypotheses and knowledge. A clear example of such an analogical relationship between the familiar and the unknown is the explanatory success of the billiard-ball model as an analogy for the collision of gas molecules. According to this model, this collision of molecules is analogue to billiard balls colliding abound on the billiard table, which aided the formulation and explanation of the rapid motion and numerous collisions of gas particles. This then led to the development and formulation of kinetic theory. On a theological level, an analogy seems to be used somewhat differently. Rather than aiding the exploration of unknown phenomena, theological analogies offer a way to describe a divine being that lies beyond the epistemic capabilities of the human mind. Humanlike traits, such as 'good' and 'wise', are considered to be analogous to the nature of the divine being, offering means to approach the divine mystery on the basis of, albeit inadequate, similarities.

Analogies, therefore, allow us to describe the unfamiliar, due to either a state of unawareness in, say, physics or biology, or the inability to grasp the divine, by means of familiarity, such as humanlike traits or current knowledge. This, then, allows scientists and theologians to construct more systematic representations of the unknown, making the unfamiliar familiar.

4.3.2 Models: Devoid of Ontology?

Models are considered to rely on analogies between phenomena familiar to scientists or theologians and the phenomena under examination.[14] For critical realists, a model offers a symbolic representation of reality and it allows us to order our experiences of both the physical and the divine. Polkinghorne illustrates this aptly in considering models as heuristic devices "by which one attempts to gain some purchase on reality or some insight into complexity, without believing that one is giving a totally accurate account of that reality or a fully adequate characterization of that complexity" (Polkinghorne, 1991: 21).

As a mental picture that provides insight into the complex structures of reality, models, according to critical realists, function as bringing order and meaning to widely diverse patterns of experience, considering them as a heuristic tool used to, albeit partially, imagine the unobservable. The aforementioned billiard-ball model of gas molecules is a clear example of this, where the collision of billiard-balls function as a model to bring meaning to the observation of colliding gas molecules. In theology, critical realists consider the notion of 'father' as a model for explaining certain characteristics of God.[15] Underpinning both examples is the *as if*-nature of models, which "reflects both a partial resemblance and a tentative commitment" (Barbour, 1974: 38). In the case of the billiard-ball model, gas molecules behave *as if* billiard-balls are colliding. The same holds true for the theological example, where God is understood *as if* being a father. As with analogies, models are used to aid scientists and theologians to understand their respective realities.

Whilst all critical realists seem to share this rather generic understanding of models as providing, albeit inadequately, representations of reality, a subtle, yet pivotal, difference emerges amongst critical realists as to whether or not models actually have any ontological pretentions. Barbour, and van Kooten Niekerk endorse this claim,[16] arguing that models "make tentative ontological claims that there are entities in the world something like those postulated in the models" (Barbour, 1997: 117). For Barbour, models – at least according to this particular claim[17] – provide a picture of

[14] See Barbour, 1966b: 158; Peacocke, 1988: 51.
[15] See Polkinghorne, 1991: 27.
[16] See van Kooten Niekerk, 1998: 62.
[17] In his *Myths, Models, and Paradigms*, Barbour seems to offer an alternative position, where he suggests that "a model is a mental construct and not a picture of reality. It is an attempt to represent symbolically, for restricted purposes, aspects of a world whose structure is not accessible to us" (Barbour, 1974: 38).

reality. A similar sentiment can be found in Peacocke, who considers models as 'candidates for reality'. As Peacocke puts it,

> In both the scientific and the theological enterprises, we have to be satisfied with models which are 'candidates for reality', which are reformable and which are as close as we can approach to the reality with our given experimental limitations and conceptual resources (Peacocke, 1979: 39).

But not all critical realists share the views of Barbour, Peacocke, and van Kooten Niekerk on this matter. In denying that models actually represent reality, Polkinghorne, for example, seems to be inclined towards a more instrumentalist understanding of models. Contrary to Barbour, Peacocke, and van Kooten Niekerk, he claims that

> there is no reason to treat models with ontological seriousness, as if they were approximate maps of reality. They are simply crude pictures of a particular process (Polkinghorne, 1996a: 19).

Models should be understood as mere explanatory devices; a tool that could be used to acquire knowledge of parts of reality. The usefulness of a model in representing reality seems to be the mark of truth, rather than offering a true description of the physical phenomena. Polkinghorne provides an example to illustrate this:

> For example, there was a version of the quark model of matter that pictured quarks as free to rattle around within the impenetrable walls of a container. This scored some successes in interpreting the energy states of hadronic (i.e. strongly interacting) matter, but no one supposed that hadrons were in fact 'bags' (to give the model its technical name!) (Polkinghorne, 1996a: 19).[18]

For Polkinghorne, it is the scientific or theological theories that emerge out of the models that have ontological pretensions, rather than the models themselves.

[18] For more examples, see Polkinghorne, 1991: 21-23.

How to explain these differences amongst critical realists? According to Polkinghorne,

> The differences between Barbour, Peacocke and myself about how it is best to understand and use the concepts of model and metaphor in science are undoubtedly influenced by our differing experiences of doing science. For example, Peacocke was an experimental biochemist; I was a theoretical elementary particle physicist. The kind of ambitious mathematical theories to which fundamental physics successfully aspires cannot be expected to be attained in more complex and subtle subjects such as biochemistry or geophysics (Polkinghorne, 1996a: 22).

Yet, despite their differences with regard to ontological considerations, critical realists do share the view that models offer an explanation and summary of the complexities of reality and the relationships amongst its objects and structures. Models are used to bring order in the messiness and chaos of 'real-world systems', with the purpose of understanding, illuminating or predicting physical and divine realities. As such, models play an essential role in the development of science and theology, critical realists maintain. But the successful construction of models is not the ultimate aim of scientific and theological enquiries, because "what is really desired is not a portfolio of models but a single theory" (Polkinghorne, 1991: 23). Before we could delve into discussing theories, we first need to address another semantic key concept: metaphors.

4.3.3 Metaphors: Conflating with Models?

Critical realists spend a significant amount of effort arguing for the pivotal role of metaphors in both science and theology. Metaphors are considered to be fundamentally linguistic, which sets them apart from models.[19] It is about the act of speaking regarding a particular state of affairs in "terms suggestive of another" (Soskice, 1985: 101). Some critical realists have conflated models with metaphors, assuming no real difference between both categories. Barbour, for example, holds that

[19] A non-linguistic model is, for example, a miniature train as a model for a full-scale train. See Soskice, 1985: 55, 101.

models are actually "*systematically developed metaphors*" (Barbour, 1974: 43).[20] Differences between models and metaphors are considered to be a matter of degree, rather than kind. Pivotal for this conflation is the role of analogies, because Barbour assumes that both metaphors and models are essentially analogical. Soskice is particularly critical of equating models with metaphors, claiming that such a conflation ends up in the so-called trap of the 'comparison theory of metaphors'.[21] As Soskice puts it, "the difficulty here, of course, is that by saying that both model and metaphor propose analogies we are in the danger of lapsing once again into a comparison theory of metaphor" (Soskice, 1985: 101) According to the comparison theory, metaphors are understood as merely offering an alternative, i.e. figurative substitution, to something that could be said literally, based on similarity. This comparison often takes the form of '*a* is like *b*', where *a* is the scientific or theological model and *b* is the metaphor. In the case of the billiard-ball model and the collision of gas molecules, the comparison theory would merely state that collision of gas molecules is *like* billiard-balls colliding. In this example, the metaphor of billiard-balls is taken to be a figurative equivalent of gas molecules, which makes metaphors function merely as tools for translation. Yet, the main issue with the comparison theory is the reducing of metaphors to relationships of comparison only, where metaphors actually have their "own distinctive capacities and achievements" (Black, 1962: 37). For one, metaphors also *create* similarities, enabling one to see certain similarities between two or more phenomena that have been regarded as dissimilar.[22]

Are metaphors then completely irrelevant to models? On the contrary, critical realists do consider models and metaphors to be closely linked. Soskice, for example, points out that

> metaphors arise when we speak on the basis of models; so if we are using the computer as a model for the brain and consequently speak of neural 'programming', 'input,' and 'feedback', we are speaking metaphorically on the

[20] Italics: Barbour. Yet, on the next page of his *Myths, Models, and Paradigms*, Barbour does point out that there are subtle differences between models and metaphors. For Barbour, "a metaphor evokes many types of personal experiences", whereas "a scientific model, on the other hand, is *systematically developed*" (Barbour, 1974: 44 – Italics: Barbour). However, as far as I can see, this difference between metaphors and models seems to be rather ambiguous, as Barbour holds that metaphors could be systematically developed as well. If this is the case, then the difference seems to fade, and Barbour really does equate metaphors with models.

[21] See Black, 1962: 35. See also Soskice, 1985: 101.

[22] See Black, 1962: 37. See also Soskice, 1985: 26.

> basis of the computer model; the intelligibility of these terms depends, initially at least, on their being related to this particular model of the brain (Soskice, 1985: 101-102).

In this sense, terms used in computer science, such as 'programming', 'input', and 'feedback', are used to explain or illustrate neurological phenomena. What makes these cybernetic concepts metaphors is the fact that these terms have a different sense in neurological studies than computer science.

How, then, should we understand metaphors? An influential definition of metaphors amongst critical realists is provided by Soskice, who considers metaphors as "*speaking about one thing in terms which are seen to be suggestive of another*" (Soskice, 1985: 49).[23] There are some important features here in this definition. First, metaphors are about the act of *speaking*, i.e. metaphors are linguistic. Whilst models could be non-linguistic, e.g. model trains, metaphors are neither physical objects nor mental events, but fundamentally linguistic. Second, metaphors provide a unity of subject-matter between two (or more) sets of associations, which conjointly depict the subject-matter. 'Two ideas for one' seems to be an apt way of describing this function of metaphors. When we, for example, describe quantum entities as 'waves' and 'particles' or use cybernetic terms as a figure of speech for neurological processes, we combine two sets of associations, e.g. neurological processes and cybernetic terms, into a unity of subject-matter. In doing so, we are speaking metaphorically about *x* in terms suggestive of another. Or, in the case of theology, when we say that God 'looks after' the people of Israel, we are using a metaphor. Metaphors, then, "may not simply be an oblique reference to a predetermined subject, but a new vision, the birth of a new understanding, a new referential access" (Soskice, 1985: 57-58).

As alluded to in the previous section on models, Polkinghorne, however, is more critical towards the usage of metaphors in science. For Polkinghorne, metaphors might be used to illustrate and elucidate complex and precise scientific concepts, but metaphors are not used in terms of aiding the development scientific insights.[24] As Polkinghorne vividly points out, "exciting though science is, its natural discourse is

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[23] Italics: Soskice. See also Peacocke, 1984: 30; van Kooten Niekerk, 1998: 61.

[24] See Polkinghorne, 1996a: 20. In an earlier stage, Polkinghorne is much more positive about the role of metaphors in the sciences. In his *Reason and Reality*, Polkinghorne infers that "I do not doubt, however, that there is some degree of metaphorical usage in physics" (Polkinghorne, 1991: 30).

prose and not poetry" (Polkinghorne, 1996a: 20). Yet, it has been Soskice in particular who is critical of this position defended by Polkinghorne. She points out that terms like 'black holes' or 'genetic code' – both of which Polkinghorne actually uses to make his argument – demonstrate just how intertwined metaphors are with the actual scientific practice, as both terms are not used to elucidate complexities but function as names for particular models and phenomena. As Soskice puts it, "only someone completely unacquainted with the language of the natural sciences could believe that it contains no metaphors at all; even the most uninformed has run across phrases such as 'time warp', 'particle charm', or 'black hole' whose use he realizes to be figurative, although he may not be certain what they signify" (Soskice, 1985: 99).

But, Polkinghorne has replied to Soskice's criticism, pointing out that metaphors could have at least two functions. First, metaphors could serve "as suggestive shorthand for the properly articulatable concepts lying behind them" (Polkinghorne, 1991: 29). The metaphor of 'black hole' then merely corresponds to the geometrical configuration of spacetime. Metaphors here are used to provide a popularised account of the scientific theory that such a metaphor represents. Second, other metaphors, such as 'particle charm', are merely "picturesque terms introduced to give a certain lightness to what would otherwise be an unrelieved technical discussion" (Polkinghorne, 1991: 29). Charm, Polkinghorne suggests, was introduced with the image of an 'amulet' in mind, because "the existence of the charm quantum number provides a way of warding off the evil of an unobserved experimental consequence which would otherwise be present in the theory" (Polkinghorne, 1991: 30).

Soskice, however, categorises the kinds of metaphors that Polkinghorne is referring to as 'metaphorically constituted theory terms', which she defines as "metaphors which are the linguistic projections of such a model" (Soskice, 1985: 102). Terms such as 'electron cloud' to describe the spatial localisation of electrons in the nucleus of an atom has a similar function. These 'metaphorical terms' should be distinguished, Soskice argues, from another group of metaphors; those metaphors that propose a model, i.e. 'theory-constitutive metaphors'; [25] a type of metaphor that is missing in Polkinghorne's account. Such 'theory-constructive metaphors' are considered to be "an irreplaceable part of the linguistic machinery of a scientific theory: cases in which there are metaphors which scientists use in expressing theoretical claims for which no

[25] See Soskice, 1985: 102. See also Boyd, 1993: 486-490.

adequate literal paraphrase is known" (Boyd, 1993: 486). The aforementioned 'programming', 'input', and 'feedback' as metaphors to describe neurological processes are considered to be 'theory-constructive metaphors', due to the fact that these cybernetic metaphors are of pivotal importance to the field of neurology. Hence, over and against Polkinghorne's claim that metaphors are less significant for science, the existence and importance of both the 'metaphorically constituted theory terms' and the 'theory-constituted metaphors' suggest the opposite, i.e. that the scientific practice is replete with metaphorical language, at least according to Soskice.

4.3.4 Theories: Collections of Models?

Scientific theories are considered to be the 'real desire' of the scientists; their ultimate aim. As Polkinghorne puts it, "what is really desired is not a portfolio of models but a single theory" (Polkinghorne, 1991: 23). Theories allow scientists to control, explain, and predict phenomena and processes. But how do scientific theories relate to scientific models? For critical realists, theories differ from models in various ways. First, whereas models are considered as able to complement each other,[26] theories aim for comprehensiveness within the respective domains. Due to this, scientists could actually only accept or believe in one single theory. As Polkinghorne puts it,

> Because a theory, within its own domain, aims at comprehensiveness, it is only tolerable to believe in one such theory at a time. Models, on the other hand, can be accepted in plurality, for each will only find utility in its own particular set of conditions (Polkinghorne, 1991: 23).

Theories are not identified with one particular phenomenon or representation. Second, contrary to models, theories – at least for Polkinghorne – are not considered as devoid of ontological pretentions. Instead of being a mere heuristic device, theories are understood as candidates for reality that offer "the verisimilitudinous description of physical reality through a widely prescribed domain" (Polkinghorne, 1991: 23). Due to the ontological commitments that underpin our models, theories are not dispensable, because their meaning is preserved if the correspondence with reality has been

[26] The wave-particle duality is an example of how, despite being apparently contradictory, two models might complement each other by being applicable to mutually exclusive contexts.

established. Thus, contrary to models, scientific theories offer a comprehensive account of its respective domain and they have ontological pretentions.

However, critical realists disagree on whether or not there is a continuity between scientific models and scientific theories. For Barbour and Peacocke, there is a clear continuity: theories are considered to be families or sets of models and metaphors, which allow scientists to structure a large range of linguistic concepts into a single scheme. As Barbour puts it, "analogies and models have unquestionably been a *fruitful source of scientific theories*" (Barbour, 1966b: 159); what is more, "one of the functions of models in science is to suggest theories which correlate patterns in observational data" (Barbour, 1974: 49).[27] Barbour provides a number of examples here to illustrate his argument, claiming that wave theory of light and its analogy with wave properties of sound, and the important role mechanical models played in the nineteenth-century.[28] Models and analogies are considered to be aids to single theories in representing the physical world, and their relationship seems to be one of continuity. A similar position can be found in Peacocke, who brings together analogies, models, and theories in arguing that "building a scientific theory turns out to be a matter of constructing a proper analogy, and this analogy is provided by a model, which is then the source of metaphorical theoretical terms (Peacocke, 1984: 31)".[29] Thus, scientific theorists construct theories to explain the actual nature and observed features of the physical world by postulating proper analogies, models, and metaphors.

Polkinghorne, however, considers models as often being discontinuous with scientific theories. Rather than a linear process from constructing a proper analogy, turning the analogy into a model, and combining these into a single theory, Polkinghorne suggests that scientific theories emerge in the creative leap of the ability of people of genius. As Polkinghorne puts it, scientific theories "emerge through a creative insight, often assisted by the search for a relevant formulation endowed with the unmistakable character of mathematical beauty" (Polkinghorne, 1996: 22). According to Polkinghorne, there are plenty of examples to illustrate this: Einstein's work on general and special relativity, Dirac's discovery of the relativistic equation of

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[27] Italics: Barbour.
[28] See Barbour, 1966b: 159.
[29] Without referring to Soskice, Peacocke reproduces an account given by Soskice, almost verbatim. As Soskice puts it, "building a theory is a matter of constructing a proper analogy and this analogy is provided by a model" (Soskice, 1985: 115). For Peacocke's endorsement of Soskice, see Peacocke, 1984: 85, note 34.

electrons, and Bohr's model of the atom. What each of these geniuses have in common is that there is no continuous relationship with previously held models and analogies, but, on the contrary, their suggestions "were strikingly different from their exploratory predecessors" (Polkinghorne, 1996: 22). Similar to their differences on models, Polkinghorne explains these differences between him, Barbour, and Peacocke in terms of their differing scientific backgrounds.

4.3.5 Understanding the Differences amongst Critical Realists

As discussed in the previous sections, there are differences amongst critical realists, such as between Barbour and Soskice, and in particular between Polkinghorne and the others. For Polkinghorne, for example, models do not have any ontological pretentions and metaphors are not significant in scientific practice, whereas the other critical realists take a different stance, attributing ontological seriousness to scientific models and considering metaphors as significant for science. How, then, should we evaluate these differences? Should we say that there are two forms of critical realism, e.g. Polkinghorne's branch of critical realism and a more general form of critical realism? I do not believe such an approach is very helpful for understanding critical realism, because there are enough similarities to consider them as being part of a family. But, at the same time, we should not exaggerate these differences.

In Chapter 1 'The Evolution of Critical Realism', I have introduced the notion of family resemblance to understand these differences between critical realists.[30] Rather than claiming that critical realism is a strict homogeneous group without any differences, we should recognise the various positions critical realists take, which Polkinghorne ascribes to as stemming from their different scientific backgrounds. But, at the same time, there are strong similarities amongst critical realists to tie them together into one single family of critical realism. In our taxonomy of critical realism, we have identified four stances that these critical realists share on the level of metaphysics, epistemology, semantics, and methodology. But where do we find similarities on the level of semantics? First and foremost, all critical realists are critical about those who endorse literalism and instrumentalism. Scientific theories are neither conclusive and fully descriptive, nor are they mere useful fictions. Science and theology lead to language that we should take 'seriously, but not literally'. Language

[30] See p. 24ff.

should be taken seriously, because our linguistic concepts do indeed refer to objects and our theories, for example, are either true or false. However, our language never captures the object to which it refers conclusively, because it is always prone to error. Second, we have explored the semantic stance of critical realism along the lines of four key concepts: analogy, models, metaphors, and theories. For critical realists, despite their significant differences, each of these key concepts are part of the semantics of both science and theology. Van Huyssteen offers a very helpful summary that puts all the puzzle pieces together in the context of theology:

> Contrary to naïve-realist or fundamentalist models that see dogma in theology, for example, as precise, literal replicas of basic biblical metaphors, the metaphoric basis of theological models and theoretic concepts now enables us to open up the meaning of that which is referred to in theological language, and to do so critically, creatively, and exploratively. For this approach, in which the scientist and therefore also the theologian attempts to say something about a reality beyond our language by means of provisional, tentative models in terms of human constructs, the term *critical realism* might be fruitful. A critical-realist approach to theology now becomes feasible because metaphors and models play such a decisive role in all cognitive development – also in theology. A critical-realist stand is realistic because in the process of theological theorizing this concept enables us to recognize the cognitive and referential nature of analogical language as a form of indirect speech. It is also critical, however, because the role of metaphoric language in theology would teach us that models should never be absolutized or ideologized, but should retain their openness and provisionality throughout the process of theorizing (van Huyssteen, 1989: 142).

Thus, critical realists aim to provide a more nuanced account of the usage of language in science and theology by providing a middle ground between two rather extreme positions: literalism and instrumentalism. Central to critical realism is their view that our linguistic concepts are more than mere useful tools – against instrumentalism, but at the same time these linguistic concepts do not exhaustively depict reality – against literalism. For critical realists, we should recognise the limitations of our theories and models, i.e. they do not provide a definitive account of reality, but at the same time we should take our language serious.

However, the semantic *via media* of critical realism is not without its own difficulties. How can we claim, for example, that our language is fallible, but nonetheless referring? Can we say that we really refer to a natural phenomenon, e.g. cell division, if we cannot fully define what we are referring to? It has been in particular Michael Durrant who has put forward arguments against critical realism, and in particular against Soskice, which we will address in the next section.

4.4 Referring but not Defining

With the overview of the similarities and dissimilarities regarding four key semantic concepts and using the family resemblance-metaphor to explain the relationship between critical realists on the level of semantics now complete, we now turn to a specific challenge that could be posed against critical realism: how to explain the claim that our linguistic concepts do not provide definitive descriptions – against literalism – but are nonetheless considered to be referring? Underpinning this challenge is a more basic, yet pivotal semantic issue: what is the relationship between our linguistic concepts and the objects to which they refer? For finding a solution to this challenge, we turn Soskice and her apparent rejection of descriptivism.[31]

According to the aforementioned literalists, as interpreted by critical realism, we need to have definitive descriptions in order to refer to an object; a position associated with descriptivist's theories of reference. We refer to an object by means of descriptive content that we associate with that particular object. What we mean by using names like 'Aristotle' and 'Alexander the Great' can be expressed by a definite description. If we, for example, say that 'the author of *Physics* was the tutor of Alexander the Great', our listeners might understand that behind this identity statement there is 'Aristotle', who was the tutor of Alexander the Great and also the author of *Physics*. If this is the case, then at that particular moment both descriptions are co-referring. Hence, our reference to a certain object is fixed by associated descriptions. Such a position was defended by, among others, empiricists, Soskice maintains, who argued that fixed and unrevisable definitions determine reference, i.e. we need to have definitive and conclusive knowledge in order to refer to a particular object. Yet, the problem with descriptivism, Soskice argues, is the difficulty it faces in accounting for

[31] It is important to note that the rejection of descriptivism and the endorsement of causal theory of reference are only mentioned in Soskice's discussion on critical realism. None of the other critical realists have endorsed such a position, and, as a result, this section only represents Soskice views.

the notion of theory change. As Soskice puts it, "for if the same term is defined in two successive theories by conflicting definitional stipulations it cannot, on the strict empiricist account, be regarded as referring to the same entity" (Soskice, 1985: 126).[32]

What, then, is Soskice's alternative? Building upon the semantic theories of Putnam and Saul Kripke, Soskice argues that we can actually refer to an object without being able to provide an exhaustive account or having conclusive knowledge of that particular object. As Soskice puts it, "reference need not involve unreviseable definition", or "one can refer to some one or some thing without providing an exhaustive or unreviseable definition of that person or thing" (Soskice, 1985: 125; 128). Whereas descriptivism requires that we provide an *individuating* description in order to refer to an object, a unique feature of that particular object that allows us to recognise that particular object from every other object, Soskice suggests that such an individuating description is not required, because we can still refer to an object even if our individuating description fails to be true. Soskice illustrates her position as follows:

> We may, for example, fix a reference simply by 'dubbing' or 'baptism', as in 'Electricity is that which is responsible for these effects'. We can even fix a reference by means of a description which is false of its object, for example, 'the man drinking the martini', when in fact he is drinking water, or when we say 'Phosphorus is the morning star' and it turns out that Phosphorus is not a star at all but a planet. What we do here is provide a description which enables the audience to pick out some one or some thing, and if our purpose is simply a referential one, it need not matter that this description turns out not to hold of its object (Soskice, 1985: 128).

But how can we refer to an object without a providing a individuating description?

Whilst recognising the limitations of Kripke and Putnam's semantic theories,[33] Soskice turns to the causal theory of reference to explain the apparent peculiarities

[32] There are more significant objections to the descriptivist theory of reference. See e.g. Kemp, 2013: 57-59 for a brief overview.

[33] As Soskice puts it, "the so-called 'causal theories' of reference are not themselves free of problems" (Soskice, 1985: 129). But Soskice continues that "this is not [to] say that both classical and causal theories of reference are simply wrong. It is rather that they are both partially right and this [is] because reference is more complex a phenomenon than it appears at first" (Soskice, 1985: 130).

here. Suggested by Putnam, the causal theory of reference denies that the descriptive content fixes the reference. Reference is fixed by an initial baptism, a ceremony of naming through which reference was originally fixed and passed on from speaker to speaker. As a result, "each speaker is a member of a particular linguistic community and thus connected by means of other speakers to a range of experience far exceeding their own" (Soskice, 1985: 149). Or, "reference is determined by speakers in contexts of use, and not simply by individual speakers but by communities of speakers whose language provide access to the states and relations which are of interest to them" (Soskice, 1985: 132). It is thus the initial dubbing that links 'Aristotle' and 'Alexander the Great' to particular human beings, and not the criterion of satisfying certain descriptions. Hence, whilst our descriptions are fallible and revisable, this state of affairs does not deprive our knowledge claims of its referential status, because the historical chain makes our references reliable. As such, Soskice takes a stance against descriptivism.

But why is this 'referring but not defining'–principle important for Soskice? It allows her to maintain that, although all knowledge claims are considered to be fallible, these claims are nonetheless referential. Such a state of affairs is – as far as I can see – of particular importance for making theological statements, because Soskice is "saying that the theist can reasonably take his talk of God, bound as it is within a wheel of images, as being reality depicting, while at the same time acknowledging its inadequacy as description" (Soskice, 1985: 141).[34] According to Soskice, the theological realist is often challenged to explain how our theological claims refer to God, because referring to God comes at a certain cost, i.e. the cost of making God a thing amongst other things and, thus, finite. With the 'referring but not defining'-principle in hand, Soskice considers the theologians as being able to ward off this challenge by pointing out that our theological claims do not *describe* God but only refer to Him; a position that Soskice suggests is similar to Anselm and Aquinas.[35]

[34] A similar sentiment can be found in Peacocke. He suggests that "we have to distinguish between referring to God and describing him; this is crucial to a critical-realist stance in theology" (Peacocke, 1993: 15).
[35] See Soskice, 1985: 138-140.

4.4.1 Durrant's Critical Response to Soskice's 'Referring but not defining'-principle

However, Soskice has received strong criticism for her 'referring but not defining'–principle, most notably from Durrant. In discussing Soskice's account, Durrant distinguishes three principles (Durrant, 1989: 133-134):[36]

1. We may refer to an object without having full definitive knowledge;
2. It is possible to "refer to an individual by a name and equally possible to refer to a kind of thing by a 'kind name' without being able to produce *any* uniquely identifying description which is part of its essence";
3. It is possible to "refer to an individual or kind without being able to produce *any description at all*".

Whilst Durrant agrees with the first, more general principle of Soskice's argument, difficulties emerge, Durrant maintains, with principles 2 and 3, which are important for Soskice's argument concerning God. As discussed above, for Soskice, we can indeed refer to God, but we cannot *describe* God. We do not need an *individuating* description in order to refer to God. Durrant is critical about Soskice's stance here, because he maintains that Soskice conflates defining and describing. As Durrant puts it, "from the fact that one may not be able to give an 'exhaustive description' of X that one may not describe X at all" (Durrant, 1989: 134). In all reference, Durrant maintains, we do indeed describe the object that we are referring to via some descriptive content that is associated with that particular object. Hence, Durrant takes a descriptivist stance here regarding reference, which leads Durrant to be critical about principles 2 and 3.

For Durrant, the second principle – referring to an object without an individuating description – is not plausible, because we need to produce at least *some* description in order to refer to an object. In order to illustrate this claim, Durrant uses the example of referring to the former Prime Minister of the United Kingdom, Margaret Thatcher. According to Durrant, we need to – at the least – be aware of *some* individuating description of Thatcher in order to recognise that we are indeed referring to her. As Durrant puts it, "although I may refer to Mrs. T without invoking some description which may be held to be essential to her identity [e.g. 'the woman living in 10 Downing

[36] Italics: Durrant.

Street'], I have to understand that it is indeed *Mrs. Thatcher* to whom I am referring and this entails that I understand the particular use of the name 'Mrs. Thatcher'" (Durrant, 1989: 134). For understanding that I am referring to Mrs. Thatcher, who lived at 10 Downing Street, the receiver needs to understand the sense of my reference to Mrs. Thatcher, i.e. some individuating description.

Durrant illustrates his criticism of the second principle by breaking down the following sentence: '*This* is what everyone calls 'Mrs. Thatcher'.[37] Important here are two elements: 'this' and 'what'. First, for Durrant, it is not sufficient to merely use a name to refer to Mrs. Thatcher on *this* particular occasion, because she is standing right in front of me. What we need is to be able to use the name on further occasions, and for doing so, we need to have some individuating description that sets apart Mrs. Thatcher from other people. As Durrant puts it, "I have to understand some description which enables me to say that I am using the *same* name on this and subsequent occasions; such description will constitute at least part of the essence (or sense) of the name" (Durrant, 1989: 135).[38] Second, we also need to be clear about the *what*. Whilst *this* fixes the reference to 'the woman who is standing right in front of you', i.e. *this* is Mrs. Thatcher, we also need to explain the reference. In explaining the reference, we have to introduce *individuating descriptions* that uniquely individuates Mrs. Thatcher from other objects. Hence, against the second principle, Durrant argues that we indeed need at least *some* description that will distinguish an object, such as Mrs. Thatcher, from other objects, and in doing so, we do not only refer to an object, but also define the object to some extent.

Against the third principle, according to which Soskice maintains that all we need for a reference to hold is the initial dubbing ceremony and the resulting historical chain, and we do not need to invoke a particular description, Durrant argues that at least some description is necessary in the initial dubbing process and he provides an example to illustrate his argument, i.e. the initial naming ceremony of the term 'gold'. As Durrant puts it, "the formulation in the 'initial ceremony' must at least read 'Whatever this F is, it is gold' – say 'Whatever this material substance is, it is gold' from which it follows (a) that at least *some* description ('F'; 'material substance') is required in this initial dubbing ceremony"; what is more, we also need a more definitive description in addition to the used indefinite descriptive term, "we require,

[37] See Durrant, 1989: 134.
[38] Italics: Durrant.

at least; 'Whatever this F (substance), namely the F (substance) at which I am now pointing [to], is gold" (Durrant, 1989: 136). Hence, similar to the argument against the second principle, Durrant maintains that we do need to invoke (indefinite and definite) descriptions in the initial dubbing ceremony, and therefore Durrant maintains that "neither the narrower [principle 2] nor the wider [principle 3] of Dr. Soskice's theses hold" (Durrant, 1998: 137).

Hence, for Durrant, our reference is fixed by a set of specific, individuating features that allow us to recognise a particular object. In doing so, Durrant is simply echoing a descriptivist point of view, and, as such, his problem with Soskice's account is rather simple: we cannot rely on the causal chain for establishing our reference. For Durrant, our reference is not fixed arbitrarily, and we should take individuating attributes into account in our reference to a particular object.

However, we will not address any strategies to ward off Durrant's critique for the following reasons. First and foremost, as far as I can see, neither Soskice nor any other critical realist has (yet) responded to Durrant's criticisms on Soskice's theory of reference, which makes it rather difficult to evaluate Durrant's criticism in the context of critical realism. In addition to this, the debate between Soskice and Durrant is simply echoing philosophical disagreements between descriptivism (Durrant) and causal theory of reference (Soskice). Finally, in the above sections, I intended to address the challenge of how to explain the claim that our language lacks definitive descriptions, but nonetheless critical realists consider our language to be referring. Soskice's account provided helpful insights into answering this challenge, and we have used Durrant's critique to problematise Soskice's reliance on causal theory of reference. [39]

4.5 Concluding Remarks

In this chapter, we have explored the semantic stance of critical realism. From the outset, critical realism positions itself against literalism, a position often associated with naïve realism, and instrumentalism. 'Seriously, but not literally' is the catchphrase that critical realists use to illustrate their alternative stance. We should

[39] Since I do believe that Durrant's critique should – at the least – be addressed by critical realists, a promising approach could be to evaluate the internal consistency Durrant's rejection of Soskice, and, for this, we could turn to the work of philosophers of language and their discussions on the nature of meaning and reference fixing. A very helpful source and starting point for such an endeavour is Evan's *The Varieties of Reference*. See: Evans, 1982.

take scientific and theological theories and models seriously, i.e. they are more than mere useful fictions, but at the same time these theories and models do not provide an exhaustive picture of reality. There is, according to the critical realist's endorsement of fallibilism, always the possibility that these theories and models turn out to be false, which also applies to even the surest theories of science. We then turned to four key categories around which the semantics of critical realism gravitates: analogies, models, metaphors, and theories. Whilst most critical realists seem to take a very similar stance regarding these key categories, it turned out that in particular Polkinghorne often takes a different stance. For Polkinghorne, for example, we should understand the relationship between models and theories in terms of discontinuity. But, should we then divide critical realism into two separate schools of thought, i.e. Polkinghorne's critical realism and a more general critical realism of the others? I have used to notion of 'family resemblance' to argue against such a division. Recognising their differences on the level of semantics, there is a significant amount of similarities to group these thinkers together under the umbrella of 'critical realism'.

However, there was another issue that needed to be addressed: how can we claim that our language lacks definitive descriptions, but at the same time consider it to be referring? Soskice in particular has comprehensively addressed this issue by introducing the 'referring but not defining'-principle, according to which references do not need definitive descriptions to actually refer to reality. What is needed, Soskice maintains, is a so-called initial baptism of the reference, which allows us to pass on the reference from speaker to speaker; a position that is called 'causal theory of reference'. Yet, Soskice has received sharp criticism to her turn towards this causal theory of reference from Durrant. For Durrant, we do need to have at least some individuating description to actually refer to an object, and Durrant seems to simply represent the general position of descriptivism. However, unfortunately, none of the critical realists have replied to Durrant's critique.

The chapters on the first three categories of our taxonomy of critical realism as resembling a family, i.e. metaphysics, epistemology, and semantics, have demonstrated the inclination of critical realists to provide an alternative sound to the voices of naïve realists. According to naïve realists, science provides an exhaustive and literal account of reality-in-itself, where science is understood as following its strict and objective rules of logic. As such, science has become the hallmark of

knowledge. Critical realists, however, contest this account by pointing out the various weaknesses underpinning naïve realism and, in particular, its lack of philosophical sophistication. Critical realism, then, offers a nuanced alternative that recognises that it is *both* the objective features of the mind-independent reality, existing independently of our conceptual schemes, *and* the creativity of the human mind, making all our knowledge claims scheme-dependent. Due to the scheme-dependent nature of our knowledge claims, all knowledge is considered to be vulnerable to error and our language is understood in terms of being serious but not literal. Our language does not just mirror reality, but our models and theories provide an account of reality with varying degrees of precision.

This state of affairs, of course, has a significant influence on how critical realists develop their views on science and theology. Critical realists seem to make two gestures, allowing them to position science and theology in terms of a close kinship rather than complete strangers. First, Chapters 5 and 6 will show that critical realists set out to define the sciences in more human terms. Contrary to the popular account of science as a logical – or even mechanical – and objective procedure that produces conclusive knowledge, critical realism endorses a more human account of science. Scientists are not detached and impersonal observers, but they are considered to be actively and passionately involved in a wider community. Second, in Chapter 7, we will explore an opposite direction with regards to theology. Where the more human elements are emphasised in their account of science, critical realists are swift in pointing out parallels between science and theology. In doing so, theology is redefined in terms more akin to science, causing theology to undergo a – as it were – 'scientific makeover'. This brings us to the fourth stance of our taxonomy of critical realism, namely its methodological stance of considering philosophy of science as constructive for developing its views on theology and its methodology. But before evaluating this scientific makeover of theology, we first need to turn to (philosophy of) science.

CHAPTER 5

THE HUMANISATION OF SCIENCE

The Scientist as Experiencing Being

In the following two chapters, a comprehensive elaboration of the more human elements in the actual practice of science will be explored. Critical realists develop two arguments to challenge the more naïve accounts of science, where science is understood in terms of a logical and objective enterprise.[1] First, and this will be discussed in this chapter, critical realists argue that scientists are passionately and personally involved in the process of acquiring scientific knowledge. There are no theory-neutral observations, critical realists maintain. Second, and this will be discussed in Chapter 6 'The Humanisation of Science: The Scientist as Communal Being', critical realists point out the significant psychological, sociological, and historical factors influencing the scientist.

After some introductory remarks on the importance of philosophy of science for critical realism (Section 5.1), a brief exploration of logical empiricism will be provided, in order to set the historical scene in which critical realism emerged (Section 5.2). Of particular importance here are the remnants of logical empiricism in the accounts of science popularisers, who seem to suggest a science that is stripped from all human factors and where science is presented as the only avenue of acquiring valid knowledge. This is followed by a discussion of two important developments in the so-called 'new philosophy of science', which has played a fundamental role in the emergence of critical realism (Section 5.3). Adherents of this 'new philosophy of science' emphasise the social dependency of the observer's conceptualisations of reality, according to which the knower is considered as contributing to the results of knowledge. In this new branch of philosophy, the observer is seen as an active, experiencing, projecting and creative being, and I will use this branch to form the backdrop against which the critical realist understanding of science will be developed. In order to put the nuanced description of the critical realist stance on science into a

[1] For a definition of naïve realism, see Chapter 1 'The Evolution of Critical Realism', p. 45.

wider perspective, this chapter then concludes with a reflection on the intentions and aims of critical realism and its commitment to a more humanised account of science (Section 5.4).

5.1 Critical Realism and Philosophy of Science

Explorations into the nature of the scientific discipline are central to the critical realist's aim to build an epistemic bridge between science and theology. From the outset, critical realists set out to demonstrate that science and its methods are not the only 'avenue' to knowledge (an assumption that is often made in the more popularised or naïve accounts of science), and, what is more, that the knowledge science acquires does not have the absolute certainty and truth that is often ascribed to it. In Chapter 3, we have explored the endorsement of the notion of fallibilism amongst various critical realists as a means to challenge such a naïve account of science.[2] Due to the fact that all knowledge is fallible, we cannot be completely sure about even the surest theories of science. Furthermore, there is no theory-neutral perceiving of physical objects. As discussed in Chapter 2 'The Mind-Independence of What?', critical realists argue that all our knowledge claims should be understood in terms of being 'scheme-dependent', whilst the objects to which these claims refer are considered to exist 'scheme-independent'.[3] As an alternative then to naïve accounts of science, a more 'humanised' science is suggested, which recognises human factors and characteristics that often underpin scientific explorations as fundamental for understanding actual practices of science and that recognises these factors have an impact on the objective description of reality that science provides.

In their endeavour to establish such a more 'humanised' view of science and warding off naïve views of science, critical realists have developed two sets of arguments. The first set of arguments is related to the scientist as an experiencing human being, an individual who is deeply interested in understanding physical reality. Central to this set of arguments is the assertion that the scientist as individual contributes to the conclusions of the scientific enterprise. Rather than a dispassionate and disinterested observer, the scientist is passionately involved in the act of understanding nature, critical realists argue. In the second set of arguments, critical realists emphasise the collectiveness in acquiring scientific knowledge. Grounding

[2] See p. 84ff.
[3] See p. 66ff.

their considerations concerning the communal side of the scientific enterprise on the work of Thomas Kuhn, Imre Lakatos and the like, critical realists set out to explain how this experiencing and knowing individual is embedded in the wider community of scientists, who share certain beliefs, values, and commitments that constitute this community. There are always psychological and sociological factors at play that influence the scientist in exploring and understanding the physical world. This chapter (Chapter 5) will be concerned with the scientist as an experiencing and passionate being, whilst the collectiveness of the scientific enterprise will be discussed in the next chapter (Chapter 6).

5.1.1 A Brief Sketch of Scientific Practice according to Critical Realism

Since the exploration of the critical realist's account of science stretches over two chapters, a brief sketch of science and its methods seem to be appropriate here. To define the critical realist's view of science with broad strokes, it considers science as operating as a critical and corporate enterprise that engages with physical reality. Science is a critical endeavour, critical realists maintain, because the theories, concepts and models that science employs to describe the physical world do not simply mirror reality. Valid knowledge about this external reality is obtained through a critical reflection upon the experiences of scientists. As Ted Peters and Carl Peterson put it, "our knowledge is more than mere perception; knowledge requires critical reflection on perception" (Peters and Peterson, 2013: 193). As a consequence of this critical reflection, all of science remains to a large extent dependent upon the human mind, i.e. all knowledge claims are scheme-dependent, which leads the critical realist to conclude that we cannot ignore the pivotal role of the epistemic subject in doing scientific research.

Furthermore, the existence of the interaction between large numbers of scientists is considered to be pivotal to the development and growth of the body of scientific knowledge. Scientists are seen as being actors in a particular paradigm-dependent, epistemic community. Barbour vividly portrays this corporate nature of the scientific enterprise as follows:

> the dependence of each man on his predecessors, the necessity of having one's results checked by others, the reliance of experimentalist on theoretician and vice versa, the value of knowledge from other fields, the fruitfulness of

> discussion and mutual criticism, and the stimulus of peers who alone can competently evaluate one's work (Barbour, 1966b: 151).

Put differently, the scientific community is the context for all scientific research and its guarantee against relativism. In preparing to become part of this scientific community, the scientist does not merely need to acquire a particular skillset and memorise a certain amount of information; what is more, the trainee also needs to learn a particular language and familiarise himself with and share a set of attitudes and conventions that are prevalent within this particular community. Science, in sum, is seen as a human endeavour within a particular community that is concerned with the exploration and understanding of a mind-independent, physical world.

Since the critical realist narrative considers science as being a human undertaking and not a mere mechanical or objective procedure, critical realists, such as Polkinghorne and Barbour,[4] often turn towards the actual practice of scientists to warrant their views about science.[5] According to Barbour, the "neglect of the dynamics of science in operation produces a distorted image of its methods" (Barbour, 1966b: 151). A recent example of such a turn towards practices of the scientist in the critical realist literature is Peters and Peterson's "The Higgs Boson: An Adventure in Critical Realism", where they set out to explore whether or not critical realism is at work in the search for the Higgs boson. Instead of exploring the scientific enterprise from a mere secluded, 'ivory tower' perspective, Peters and Peterson have taken a similar approach to Bruno Latour, who took an anthropological approach to the study of scientific practice.[6]

The underlying principle in Peters and Peterson's study is the claim that "[s]cience requires faith in order to be science" (Peters and Peterson, 2013: 185). Faith is defined as a pre-scientific belief that consists of a set of presuppositions and expectations about the character of the physical world and its correspondence with our mental picture of

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[4] See e.g. Polkinghorne, 1996b: 23-38, which is a more biographical account that Polkinghorne uses to discuss the social nature of the scientific enterprise.

[5] This emphasis on the actual practice of the scientists has also been particularly significant for the proponents of the historical turn and the sociologists of the Sociology of Scientific Knowledge, which will be explored in Chapter 6 'The Humanisation of Science: The Scientist as Communal Being', p. 169-173.

[6] Latour is not so much interested in the abstract account of the acquisition of knowledge as offered by his colleagues in philosophy. On the contrary, Latour sets out to examine how scientific facts are produced as an insider; "a kind of anthropological probe to study a scientific 'culture' – to follow in every detail what the scientists do and how and what they think" (Salk, 1986: 12). See Latour, 1986.

it; a pivotal element in our quest for understanding reality scientifically but ignored by naïve realists. In the case of the Higgs boson, this notion of faith was evidently at play, claims Peters and Peterson. The Large Hadron Collider (LHC) experimenters put their faith in the Higgs boson as a mathematical map that these scientists apply in their everyday scientific activities to demarcate the relevant from the irrelevant.[7] Consequently, instead of a simple correspondence between prediction and result – a position taken by naïve realists, Peters and Peterson suggest a more subtle understanding of this correspondence that emphasises the interaction between the experiment's assumptions, the mathematical model and the object, which affirmatively answers whether or not critical realism was at play in the search for the Higgs boson. Hence, the turn to the actual practice of science enables critical realists to dissect, as it were, various human elements that become pivotal in their attempt to reject mere naïve realist accounts of science.

Therefore, the critical realist alternative to naïve accounts of science gravitates around the various human elements that underpin scientific practice. For critical realists, science should not be understood in terms of merely following logical rules and objective procedures, but they endorse a more nuanced account that recognises the pivotal role of the scientist as passionately involved within the wider community of science. But before we probe a bit deeper into the critical realist's argument of considering the scientist as an experiencing being, we first need to have a clear understanding of the opposing school of thought: logical empiricism and, in particular recent remnants of the positivist's tradition.

5.2 Logical Empiricism and its Remnants of a Dehumanised Science in the Work of Science Popularisers

What are the contours of a more dehumanised account of science? Critical realists have sometimes read logical empiricism along the lines of offering a more dehumanised version of science, and it has been in particular the lasting influence of logical empiricism on the common image of science today.[8] But before we could look into the

[7] In defining the everyday activities of the scientific community, Peters and Peterson distinguish five general stages, namely (1) collect data, (2) examine and correlate data, (3) develop and test hypotheses, (4) state a theory, and (5) submit findings for peer review and publication. See Peters and Peterson, 2013: 189-192.

[8] For references to logical empiricism in the literature of critical realists, see e.g. Barbour, 1966b: 162-164; Polkinghorne, 2006a: 26, 114; *idem*, 2006b: 15.

contemporary science popularisers, we first need to have a better understanding of logical empiricism.

Established by Moritz Schlick and Otto Neurath, logical empiricism was formed by a group of people that were scientifically oriented and who disagreed with various trends in philosophy, particularly with philosophers such as Kant and Hegel. Godfrey-Smith characterises the logical empiricist's school of thought as a "plea for Enlightenment values, in opposition to mysticism, romanticism, and nationalism" (Godfrey-Smith, 2003: 39). Contrary to more 'obscure' or 'mystical' forms of knowledge, logical empiricism championed reason and the logical above everything else. As a result of, and inspired by, the developments in science, mathematics, logic and philosophy of language in the early years of the twentieth century, the logical empiricists shared a common concern for the methodology of science, and their central methodological ideas are twofold: the repudiation of synthetic *a priori* assertions, and the demonstration of the meaninglessness of metaphysical claims by means of the verifiability principle of meaning. Let us probe a bit deeper into both of these methodological ideas in the following sections.

First, the denial of the possibility of synthetic *a priori* assertions provides the positivist tradition with a formula on which they can ground their critique of the traditional Kantian philosophy and to find a foundational role for logic and mathematics in the scientific method.[9] Contrary to Kantian epistemology, the logical empiricists suggest that Kant's notion of the possibility of synthetic *a priori* judgments is false and that all of logic and mathematics is analytic *a priori*. Such analytic *a priori* statements are not true or false by virtue of any extralinguistic factors, but only on the basis of the meaning of the terms in the statement.[10] Insofar as the truth-value of these analytic assertions are determined by a set of rules within a linguistic framework and are prior to experience, they are not concerned with the world as it is. In other words, for logical empiricists, logical and mathematical statements simply record a

[9] See Chapter 2 'The Mind-Independence of What?' for a brief explanation of the difference between the notion of analytic and synthetic judgements and a priori and a posteriori knowledge, p. 61n19.

[10] Carnap calls these statements L-determinate statements, i.e. either L-true or L-false. For example, it is sufficient to understand the statement 'John's beard is ginger or John's beard is not ginger' in order to ascertain its truth. This statement holds in every possible world. The meanings of the logical words (i.e. 'is, 'or', 'is not') are necessary to establish the truth of this statement, whereas the meanings of the descriptive particles (i.e. 'John', 'beard', 'ginger') are irrelevant. For Carnap, a sentence is L-true if and only if it holds in every state-description, i.e. a tautology (Carnap, 1956: 10).

conventional decision to use these symbols in a particular way, and hence they are empty of any factual content.

The second central idea of logical empiricism is the verifiability principle of meaning, which aimed to furnish a set of rules to determine whether or not a sentence is meaningful. Ayer defines the verifiability criterion as follows:

> we say that a sentence is factually significant to any given person, if, and only if, he knows how to verify the proposition which it purports to express – that is, if he knows what observations would lead him, under certain conditions, to accept the proposition as being true, or reject it as being false (Ayer, 1971: 16).

For a statement to be verifiable it must be capable of being demonstrated true or false, at least in principle, and it can only be applied to assertions that are synthetic, because analytic statements are *a priori* true.[11] Metaphysical statements are the prime example of failing to conform to these conditions of the verifiability criterion, because these statements are neither reducible to assertions that could be confirmed on the basis of observation sentences nor analytic *a priori*. For example, the assertion 'there is a copy of Kant's *Critique of Pure Reason* on my desk' is verifiable, because it can be proven to be true by seeing or touching the copy, but the theological statement that 'Jesus is *homoousion* with the Father' is not even in principle verifiable. Such a theological statement is neither analytic *a priori* true nor capable of being proven true or false by observation.

Contrary to these theological ideas or speculative metaphysics, logical empiricists aimed to develop a scientific *Weltauffassung*. According to the manifesto *Wissenschaftliche Weltauffassung*, "[s]o kommt es, daß in vielen Ländern die Massen jetzt weit bewußter als je zuvor diese Lehren ablehnen und im Zusammenhang mit ihrer sozialistischen Einstellung einer erdnahen, empiristischen Auffassung zuneigen" (Neurath, Hahn and Carnap, 1929: 315).[12] For logical empiricists, metaphysical

[11] Ayer draws a distinction for an assertion to be practically verifiable and verifiable in principle, see Ayer, 1936: 16. There are certain propositions that one is unable to verify, because one could "(…) lack the practical means of placing ourselves in the situation where the relevant observations could be made" (Ayer, 1936: 17).

[12] Translation: "[t]hat is why the masses in many countries now more consciously reject these doctrines and, in coherence with their socialist attitude, lean towards a down-to-earth empiricist view."

speculations do not only lead to invalid thinking but to unsuitable politics as well.[13] It is the logical empiricist tradition that presents such a down-to-earth empiricist view, in contrast to the speculations of theology and metaphysics.

5.2.1 Remnants of Logical Empiricism in Popular Literature

Although the logical empiricist's school of thought is considered by many as an unviable position in the philosophy of science nowadays,[14] various remnants of this tradition are of great importance in understanding the inclination towards what we might call objectivism in the common image of science today, according to which science delivers an objective description of physical reality and human factors do not influence or have an impact on this objective image delivered by science. Wentzel van Huyssteen describes this influence of logical empiricism on our common image of science in the following terms:

> What clearly emerges from the above [i.e. van Huyssteen's discussion on logical empiricism] is that science is seen as a rational activity guided by a certain logic or methods in its pursuit of a quite specific ideal of objectivity. Thus, originated what we might now call the standard conception of science. This conception links directly with the model of natural sciences in which scientific knowledge is equated with objectivity and rational cognition is invoked in the quest for a true conception of reality. The controlled collecting of experiential data makes it possible to arrive at certain empirical generalizations or laws by way of inductive generalizations. If such hypotheses are successfully tested or verified, a new scientific law has been discovered and can be integrated accumulatively with the growth of scientific knowledge (van Huyssteen, 1989: 7).

Therefore, the basing of scientific knowledge in logical, factual, and value-free procedures as suggested by logical empiricism has led to our common image of science, van Huyssteen maintains, and, indeed, a number of science popularisers, such

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[13] For the notion of social change in logical empiricism, see e.g. Cartwright, Cat, Fleck, and Uebel, 1996; Uebel, 2004.

[14] Various arguments have contributed to the demise of logical empiricism, which were either concerned with its philosophical adequacy (e.g. the Duhem-Quine thesis) or historical criticisms (e.g. historical turn in philosophy of science). A number of these arguments will be explored in more detail below and in Chapter 6 'The Humanisation of Science: The Scientist as Communal Being'.

as Richard Dawkins and Lawrence Krauss, seem to assume that science is indeed objective along the lines of logical empiricism that we have discussed above, free from any metaphysical or epistemological presuppositions; what is more, science is understood as being able to explain and answer satisfactorily the deepest puzzles of humanity. Illustrative for such a theory-free understanding of science is Barrow and Tipler's claim that

> whereas philosophers and theologians appear to possess an emotional attachment to their theories and ideas which require them to believe them, scientists tend to regard their ideas differently. They are interested in formulating many logically consistent possibilities, leaving out any judgment regarding their truth to observation (Barrow and Tipler, 1988: 15).

There are no presuppositions or paradigms, according to Barrow and Tipler, that shape the scientist's observation and knowledge of the object studied; what is more, they assume a direct, or what critical realists would call 'naïve', correspondence between the scientific formulas and theories and the 'furniture' of physical reality. The difference with critical realists is evidently clear. Whereas Barrow and Tipler define this correspondence along the lines of our formulas and theories with the physical object, Peters and Peterson – as discussed above – understand correspondence as an interaction between our *assumptions* and *conceptual frameworks*, the mathematical model and the object under investigation.

Despite various efforts of philosophers, theologians, and particularly the science-theology community, this rather 'naïve' understanding which science popularisers promote is thus still prevalent today, particularly in literature that tends to be written for larger audiences. Other recent examples of such a more naïve account are several expressions of the eminent theoretical physicist and Nobel laureate Steven Weinberg. In his contribution to *The One Culture*, Weinberg asserts that

> there are truths out there to be discovered, truths that once discovered will form a permanent part of human knowledge (Weinberg, 2001: 126).

This explicit inclination towards epistemic optimism in Weinberg's writing is a characteristic feature of a more naïve realist understanding of science. Acquiring

scientific knowledge is a linear progress of discovery, in which something previously unknown becomes known, and once it is known, then we know it infallibly and permanently. Weinberg holds a similar view towards the laws of nature:

> [Laws of nature] are culture-free and they are permanent (…). [A]side from inessentials like the mathematic notation we use, the laws of physics as we understand them now are nothing but a description of reality (Weinberg, 2001: 123).

In both passages, Weinberg's optimistic view of the capabilities of the scientific community does not merely seem to assume that there are entities out there, such as natural laws, waiting to be discovered, but that scientists are also able to discover these laws of nature; what is more, scientists *know* that they have discovered the until-then-unknown laws. The ability of the scientist to discover these laws of nature assumes a direct correspondence between the models and concepts we have and the ontological objects to which the scientific theory directs itself. Scientific theories describe the way the world is, directly and immediately, without any involvement of the knowing subject influencing the acquisition of scientific knowledge. Our knowledge claims are considered to be scheme-independent. As a result, naïve realists – as construed by critical realists – presuppose that there is only one true and complete description that can be known with absolute certainty of reality-in-itself.

This tendency of naïve realism towards epistemic optimism therefore leads to the dismissal of the role of the knowing subject in the process of acquiring knowledge. Scientists operate in a kind of mechanical way, without any interference of, say, personal preferences. This dismissal is vividly portrayed by Gilkey:

> the knowing subject is reduced to a known object, consciousness to neurology, the ordered cosmos of science to a system of inert parts, all without the organizing mind of the scientist, the genius of the neurologist, the creativity of the knowing subjects – who, incidentally, are performing the reduction (Gilkey, 1993: 16).[15]

[15] This notion of a sharp demarcation between the generation of ideas and their validation is deeply embedded in the naïve accounts of science. Although he was not a naïve realist, this demarcation has been suggested by Hans Reichenbach, who is considered as being the "great empiricist of the twentieth

However, the acknowledgment of the knowing subject as an actor in acquiring knowledge is pivotal for critical realists, because – as discussed in Chapter 2 'The Mind-Independence of What?' – critical realism considers all our knowledge as scheme-dependent.[16] Rather than seeing the scientist as merely perceiving and recording the raw data, critical realists set out to provide a more nuanced account that recognises the pivotal role of our mental concepts in engaging with reality. In the following section, we will explore how this pivotal role of the knowing subject is developed in the context of science as an alternative for the accounts of the science popularisers in more detail by exploring the work of two very significant philosophers for critical realism (Section 5.3), namely Norwood Hanson and Michael Polanyi, and we will put these considerations into a wider perspective in Section 5.4.

5.3 Critical Realism and the 'New Philosophy of Science'

Rejecting the naïve realist account of science, in which any mode of theological thinking is invalid because science is considered as being the only reliable guide to knowledge, critical realism maintains that the inclination towards epistemic optimism represents a misinterpretation of the nature of acquiring valid (scientific) knowledge. The critical realist's main concern with any form of naïve realism is that "it does not take into account the sophisticated web of interpretation and judgement involved in any experimental result of interest" (Polkinghorne, 1986: 12). In putting forward this insight, critical realists are following a trend that reached its peak in the works of Michael Polanyi, Norwood Hanson, and Paul Feyerabend; all of whom shared a common concern for the contribution of the knowing subject to the process of acquiring knowledge.[17]

Important, therefore, for the critical realist's endeavour of warding off the remnants of logical empiricism is the emergence of this 'new philosophy of science' of the mid-

century" (Salmon, 1977: 3). He made a distinction between the 'context of discovery' and the 'context of justification'. Despite being celebrated as the hallmark of modern philosophy of science, Reichenbach's distinction, however, is considered by many as being rather ambiguous (see e.g. Schickore and Steinle, 2006). Analogous to Reichenbach's demarcation is Karl Popper's statement that "accordingly I shall distinguish sharply between the process of conceiving a new idea, and the methods and results of examining it logically" (Popper, 2002: 8).

[16] See p. 66ff.

[17] In discussing these philosophers, the intention is not to provide an in-depth analysis of their philosophical views of science. The philosophical systems developed by each one of these philosophers could be turned into a dissertation on its own. Instead, the following sections will provide an exploration into the relevant, yet pivotal, elements of the 'new philosophy of science' that have been used to underpin a critical realist philosophy of science.

1950s and 1960s. Rather than the detached and dispassionate mechanical process that the logical empiricists have put forward as the correct view of science, adherents of the 'new philosophy of science' moved away from the abstract and logical approach of the logical empiricist to taking seriously again the scientist as a human being, the scientific community and the often chaotic history of scientific developments.[18] Acquiring scientific knowledge is not so much only about objective and pure empirical facts, as it is also about the central role prior knowledge, beliefs, and theories have in determining what we perceive. Pivotal, thus, to this so-called 'new philosophy of science' is the notion that acquiring knowledge is a theory-laden activity; a phrase that is coined by Hanson. Contrary to a dehumanised view of science of the science popularisers, according to which all scientific inquiry is a mere objective and theory-free abstraction, the humanised view depicts science as a hermeneutical art that is carried out by trained minds, i.e. science is theory-laden. As such, this turn in philosophy provides a rationale for critical realists to offer an alternative to the remnants of logical empiricism in popular literature. In the following sections, the influence of the 'new philosophy of science', and most notably the work of Hanson and Polanyi, on critical realism will be explored.

5.3.1 Norwood Hanson and his Influence on Critical Realists

Attacking logical empiricism on the notion of observation, Hanson's oft-quoted "seeing is a 'theory-laden' undertaking" runs like a leitmotif throughout the critical realist account of science.[19] Drawing on the findings of the Gestalt psychology and the 'New Look' in perception after the Second World War, Hanson proposed a fundamental distinction between physical objects and our visual experiences. In order to illustrate this distinction, Hanson explores the disagreement between Johannes

[18] It would be incorrect to consider this 'new philosophy of science' as constituting a school of thought, due to profound differences. Nevertheless, adherents of the 'new philosophy of science' may be seen as a heterogeneous group of philosophers that indicated a particular trend in the philosophy of science, i.e. the downfall of logical empiricism, by sharing a common attitude towards the rejection of formal logic as the primary tool for the acquisition of scientific knowledge.

[19] See e.g. Barbour, 1966b: 139; Polkinghorne, 1986: 12-13; Gilkey, 1993: 27; van Kooten Niekerk, 1998: 62. Interestingly, both Barbour and Polkinghorne seem to misread Hanson. According to Barbour, Hanson claims that 'all data is theory-laden' (Barbour, 1966b: 139; *idem*, 1974: 94; and 1997: 108). However, for Hanson, it is not the data themselves that are theoretically loaded, but it is the process of observation that is theory-laden. Polkinghorne, on the other hand, takes Hanson's argument to mean that scientific observation is always *seeing as* (see Polkinghorne, 1986: 13). Yet, Hanson argues that it is both *seeing as* and *seeing that* that constitute the notion of observation, in which *seeing that* refers to the thing similar to a visual experience and *seeing as* expresses the role of preunderstanding in the act of observation.

Kepler and Tycho Brahe regarding planetary motion.[20] The issue at hand here is whether or not Kepler and Tycho see the same brilliant yellow disc in the blue expanse, whilst standing on a hill watching the dawn, despite the fact that they hold different views regarding planetary motion. Naturally, we would agree upon the fact that at least *something* about their visual experience is similar, namely both Kepler and Tycho are visually aware of the sun. Hanson defines this sense of having a similar visual experience as *seeing that*. In *seeing that,* an observer is visually aware of, say, a regular box if the observer *sees that* the box is six-faced, eight-cornered, and twelve-edged. When a second observer enters the room, we would expect that she would have a similar visual experience, in that she would observe the same features that denote this particular box. Seeing that *x* is a box simply means that a box is made up by these elements.

For Hanson, however, *seeing that* does not exhaust the concept of observation, because this sense of seeing is not of much epistemological importance. *Seeing that* is merely being aware of certain features that denote a particular object *x*, whereas – for Hanson – the epistemological importance lies in the process of ordering and categorising the elements that make up *x*. Furthermore, *seeing that* does not adequately explain the numerous controversies in science, with the Kepler-Tycho controversy as Hanson's prime example.[21] There is a sense in which Kepler's and Tycho's seeing-of different things do not begin with the same data, although the elements of their visual experience are similar, i.e. both Kepler and Tycho are visually aware of the brilliant yellow disc.

What then do we need to add, according to Hanson, to our theory of observation to explain these controversies in science? Pivotal then to Hanson's understanding of seeing is the claim that the "observation of *x* is shaped by prior knowledge of *x*" (Hanson, 1958: 19). Scientific theories influence the scientist's perceptual observation and all acts of knowing involve a preunderstanding. For example, even though a scientific layperson sees the same physical object, the visual experience vastly differs from what a biologist sees, due to the fact that the layperson must learn some biology before he can see what the biologist sees. For the layman to recognise *x* as an *x*, he must have a concept of an *x*. In the case of Kepler and Tycho, they see different things due to their differences in prior knowledge, i.e. difference in *seeing as*, and yet they

[20] See Hanson, 1958: 5-8.
[21] For a helpful examination of Hanson's argument see Kordig, 1971: 452-454.

see the same thing because both Kepler and Tycho have the same visual experience, i.e. *seeing that*. In other words, contrary to the logical empiricists, who argue that there is a clear distinction between the acquisition of sense data and interpretation, Hanson holds that interpretation is already there in the act of observation. As such, the epistemic subject is involved in the process of knowledge acquisition. In clarifying the important link between scientific knowledge and perception, Hanson concludes that the "disparities in their accounts [i.e. Kepler and Tycho in particular and scientific controversies in general] arise in *ex post facto* interpretations of what is seen, not in the fundamental visual data" (Hanson, 1958: 8). This explains the various controversies in science.

There are numerous implicit references to Hanson's notion of theory-ladenness in the critical realist literature, whilst others have engaged explicitly with Hanson's ideas. An example of this can be found in the work of van Kooten Niekerk, where he uses Hanson's framework of the two senses of seeing.[22] In his contribution to *Rethinking Theology and Science*, van Kooten Niekerk explores the issue of whether or not it is possible to know the way the mind-independent, physical world actually is. In order to elaborate upon this issue, a distinction is made between sensation, which is understood as a sensual phenomenon as such, and perception, i.e. an interpreted sensation. Whereas a sensation confronts the observer with an external world and the objects it contains, in the act of perception the observer does something with his sensations, namely he structures the sensations into a certain recognisable way by means of prior knowledge or conceptual systems.[23] These conceptual structures or systems that the perceiver uses to structure a sensation are historically and socially conditioned, because these systems do not have their properties *simpliciter*, but only relative to a particular conditioned framework. As a consequence, the validity of truth

[22] See e.g. Holmes Rolston III, 1997: 13, who makes a similar distinction between *seeing* and *seeing as*. According to Rolston, a physicist, for example, sees an electron *as* a wave or a particle.

[23] See van Kooten Niekerk, 1998: 55-56. This is akin to Hanson's distinction between the two senses of seeing. Later on in the article, the influence of Hanson's two senses of seeing on van Kooten Niekerk becomes even more apparent. Van Kooten Niekerk claims that the distinction between 'reference as such' and 'the way of referring' should be considered essential for a sound understanding of the interplay between object and subject. Whereas the 'way of referring' is "always dependent upon theory (except for the use of pure signs like "this" or "that")", the 'reference as such' "may be unambiguous and continuous in spite of changing theoretical interpretations" (van Kooten Niekerk, 1998: 63). As a result, van Kooten Niekerk concludes, the object to which the observation statement refers really exists, whilst the descriptive content of an observation statement is theoretically laden and might change over time.

claims hold only in correspondence with the relevant framework. According to van Kooten Niekerk, then, "perception does not give a precise reflection of the world", due to its socially and individually conditioned nature (van Kooten Niekerk, 1998: 56). This notion of relativism is pivotal to van Kooten Niekerk and seems to be important for critical realism in general.

As discussed in Chapter 2 'The Mind-Independence of What?', central to critical realism is the idea of reality existing independently of our perspectives, but that our knowledge claims about reality are always existing relative to our conceptual scheme.[24] Against more naïve accounts of science, critical realists reject the idea of theory-free or theory-neutral observation, because all knowledge claims are grounded in a socially conditioned conceptual framework. Seeing tables and chairs *as* tables and chairs requires that the epistemic subject has prior knowledge and concepts that allow him to formulate his observation-statement. It is Hanson who provides a vocabulary for critical realists to maintain the argument in the context of science, namely that our ideas of the mind-independent reality and its furniture are always laden with a particular conceptual framework.

5.3.2 Michael Polanyi's Reinstatement of the Personal

As mentioned above, Hanson's assertion that interpretation is already there in the act of observation is central to the critical realist's effort to ward off naïve realists' views of science. There is no theory-free or theory-neutral engagement with reality, critical realists maintain. But in their endeavour to explicate a more humanised view of science, the notion of theory-ladenness on its own does not seem to be sufficient for critical realism. Although the notion of theory-ladenness opens the door for the personal involvement of the scientist, critical realists want to take a step further and reinstate the epistemic subject as an experiencing, contributing, evaluating, projecting and passionate human being, which as a result leads to theory-laden observations.

Therefore, a further refinement is necessary, and in doing so, most critical realists turn to the work of Michael Polanyi; a Hungarian chemist and philosopher.[25] In a similar manner as Hanson, Polanyi attacked the logical empiricist's tradition by

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[24] See p. 66ff.

[25] Polanyi's epistemology of the personal has been particularly significant in Barbour's and Polkinghorne's elaborations of critical realism. See e.g. Barbour, 1966b: 182-185, Polkinghorne, 1994: 47; *idem*, 1998: 106. For a helpful overview of Polanyi's influence on the development of critical realism, see Losch, 2011: 166-190.

deeming their illusion that objective and impersonal knowledge is possible as invalid. He dedicated his philosophical studies to indicating the logical empiricist's blindness to the non-codifiable and creative nature of the actual practice of the scientist in acquiring scientific knowledge, which led to an alternative epistemology of the personal. According to Polanyi, the objectivist's ideal of logical empiricism, which is "based on the disjunction of subjectivity and objectivity, seeks – and must seek at all costs – to eliminate from science such passionate, personal, human appraisals of theories, or at least to minimize their function to that of a negligible by-play" (Polanyi, 1958: 15-16). Contrary to this objectivist framework, Polanyi suggests a responsible participation of the subject in the process of acquiring knowledge; a so-called merger of, on the one hand, the knower's act in the acquisition of knowledge and, on the other hand, objective knowledge.

This integration of subjectivity and objectivity into the notion of personal knowledge, appealing against any form of detached or dispassionate knowledge, runs as a leitmotif throughout Polanyi's oeuvre. In proposing an alternative epistemology, Polanyi distinguishes two kinds of knowledge: on the one hand, explicit, formal, and articulated knowledge, and, on the other hand, tacit, unarticulated and non-formalised knowledge. Tacit knowledge is a type of knowledge that can neither be captured by mathematical signs nor language. It is a form of knowledge that the knower knows he has, but which he cannot describe in terms other than a skilful performance. As he puts it, the act of knowing should be understood in terms of "an active comprehension of the things known, an action that requires skill" (Polanyi, 1958: vii). Polanyi illustrates this point by daily activities, such a riding a bicycle. Although a cyclist is aware of knowing how to cycle, she cannot specify explicitly the details of cycling in any adequate sense. Polanyi then argues – against logical empiricism – that one cannot achieve any explicit knowledge without tacit knowledge. As he puts it, "all knowledge is *either tacit* or *rooted in tacit knowledge*. A *wholly* explicit knowledge is unthinkable" (Polanyi, 1966: 7).[26] With the notion of tacit knowledge in his hands, Polanyi argues that his alternative epistemology of personal knowledge provides a promising integration of objective and subjective aspects in knowledge acquisition.

But we need to probe a bit deeper into understanding this notion of tacit knowledge and the place it has in Polanyi's epistemology. Analogous to the distinction between

[26] Italics: Polanyi.

parts and wholes in Gestalt psychology, Polanyi's tacit apprehension of knowing gravitates around a triad that underpins the inaccessibility of acquiring a wholly explicit, formal, and articulated knowledge.[27] First, each act of knowing involves a focal target, which directs as it were all efforts to acquire knowledge to this particular point. In the act of being *focally aware*, one is conscious of a Gestalt, a coherent whole. The pianist, for instance, directs his attention from what he is doing with his fingers to the piece he is playing. However, one might say that the pianist is *subsidiarily aware* of the movement of his fingers while playing the piano, which is the second element of the triadic relationship of tacit knowing. Subsidiary awareness consists of two kinds of clues on which the object at the centre of the observer's attention depends. On the one hand, there are certain subliminal clues that the observer cannot experience directly. For example, one cannot experience the contraction of the ciliary muscle of the eye to achieve accommodation, i.e. the ability of the eye to change its focus for viewing objects at varying distances. On the other hand, there are what Polanyi calls marginal clues that the observer could see directly if he wanted to. To neither kind of clue does one attend directly, "yet both kinds contribute to the apparent reality of the object, on which [one's] attention is focused" (Polanyi, 1966: 2-3). The third and final element of this triad is the *epistemic subject*, who is able to perceive coherently numerous subsidiary clues jointly as one particular object. John, for example, sees a white woolly object with hind feet grazing in flocks in the fields and integrates all these characteristics into the coherent object of a sheep. In every skilful act of acquiring knowledge, the knower engages in the process of attending *from* the parts *to* their joint meaning. Contrary to the logical empiricist's ideal of detached and dispassionate of knowledge, Polanyi positions the knowing subject at the centre of the acquisition of knowledge by stressing the fact that unspecifiable subsidiary elements are present in every act of knowing and, consequently, this ideal of a wholly explicit and articulated knowledge is false.

Polanyi's reinstatement of the person has received a warm reception in the science and theology dialogue.[28] In their attempt to bridge, as it were, the apparent objectivity of

[27] See Gelwick, 1977: 63-64.

[28] However, Polanyi's influence seems to be subtler than Hanson's. In the case of Hanson, it is rather evident that his influence has been primarily in the notion of the theory-ladenness of scientific data. Yet, Polanyi's epistemology of the personal implicitly seeps through various critical realists' arguments that underpin each distinctive understanding of critical realism.

science and theological subjectivity, critical realists have found in Polanyi's oeuvre a vocabulary to expound the scientific enterprise in more human terms, instead of a mere mechanical process of naïve realism.[29] Contrary to this mechanical understanding of observation, the Polanyian vocabulary is used to describe the relationship between the knower and the thing known in terms of interplay, according to which the object is never itself independent of the observer and vice versa. Knowing, in other words, is considered to be a mutual relationship between the knower and the object known. Due to this mutual relational nature, the epistemic subject cannot know the object in its existence independent of the knower, because the known object is influenced by the knower in the process of acquiring knowledge.[30]

Barbour, for example, proposes a new definition of the notion of objectivity by using Polanyi's epistemology of the personal, arguing that his modified definition of objectivity allows for the "*contribution of the scientist* as experimental agent, as creative thinker, and as personal self" (Barbour, 1966b: 176).[31] Even though scientific theories and models are considered to hold some degree of objective knowledge in that these theories represent a mind-independent physical world, critical realists acknowledge the inescapable subjective constituents of acquiring knowledge, because of the personal involvement of the epistemic subject. Rolston aptly describes this by arguing that "the knower always enters into her descriptions and cannot escape her framework" (Rolston, 1997: 17). Insofar as it concerns the acquisition of knowledge, scientists are not considered to be in a so-called blank state, or tabula rasa, because one cannot think without frameworks and paradigms underpinning their attempt to

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Furthermore, it is rather interesting that the references to Polanyi's epistemology of the personal decreases over time in both Barbour's and Peacocke's oeuvre. Whereas Peacocke, for example, frequently refers to Polanyi in his *Science and the Christian Experiment*, even maintaining in his *Creation and the World of Science* Polanyi's analyses are "the basis of the argument of this appendix and of much else in the rest of this volume" (Peacocke, 1979: 371), there seems to be – as far as I can see – no mention of Polanyi in Peacocke's *Theology for a Scientific Age*. This leads Losch to conclude that "(…) dass Polanyi in Peacockes Aufnahme des Kritischen Realismus (im Gegensatz zur späteren Rezeption Polkinghornes) keine Rolle spielt. Peacocke beruft sich stattdessen auf dafür bekanntere und vielleicht auch berufenere Vertreter der Philosophie" (Losch, 2011: 188). (Transl.: "(…) Polanyi has no significant role in Peacocke's endorsement of critical realism, contrary to Polkinghorne's later acceptance. Instead, Peacocke refers to more well-known and perhaps more competent philosophers".) A similar decrease of Polanyi's influence on Peacocke can be found in Barbour, but, contrary to Peacocke, Polanyi does remain present in Barbour's work on science and theology.

[29] N.T. Wright, for example, uses terms such as 'love' and 'stewardship' to describe the relationship between the knower and the known in scientific research. Wright eloquently describes this relationship as follows: "To know is to be in a relation with the known, which means that the 'knower' must be open to the possibility of the 'known' being other than had been expected or even desired, and must be prepared to respond accordingly, not merely to observe from a distance" (Wright, 1992: 45).

[30] See e.g. Barbour, 1966b: 177-178.

[31] Italics: Barbour.

explain the physical world. As a result, then, scientists are not disinterested observers, free from any factor that influences their research. On the contrary, in addition of looking at the cosmos, each scientist also contributes to a certain degree to the construction of his or her cosmos by producing knowledge that is fundamentally scheme-dependent.

Another example of Polanyi's influence can be found in Polkinghorne's oeuvre. On a more biographical note, Polkinghorne confesses that

> It will be apparent that I am considerably influenced by the writings of Michael Polanyi. I find his account of what scientists are doing to be one which is actually recognizable by a practising scientist (Polkinghorne, 1994: 147).

Where can we find this influence of Polanyi on Polkinghorne? In a Polanyian way, Polkinghorne considers the search for scientific truth to be an "intellectual adventure rather than the execution of a programmed procedure" (Polkinghorne, 1994: 32). As a starting point on this grand intellectual adventure, the scientist carefully and skilfully selects an initial point of view in order to make sense of what is going on in physical reality. According to Polkinghorne, the adoption of such a prior interpretive framework introduces two circularities in the acquisition of knowledge.

First, there is a hermeneutical circle, according to which "we have to believe in order to understand and we have to understand in order to believe" (Polkinghorne, 1994: 32).[32] Scientists, Polkinghorne maintains, need to set aside their doubts for a certain amount of time in order to understand a particular natural phenomenon. However, their doubts need to be proven valid or invalid at a certain moment, otherwise there is no reason for setting aside one's doubts in subsequent experiments. In the search for the Higgs boson, for example, physicists needed to set aside their doubts for a while or find cogent reasons in order to justify their exploration into the existence of this boson. Yet, if the physicists at CERN's LHC were not able to prove the existence of the Higgs boson, then there might well be valid reasons to doubt the existence of the boson.

[32] Polkinghorne reformulates this hermeneutical circularity in his *Scientist as Theologians*: "we must adopt a point of view in order to understand experience; experience must confirm or modify our chosen point of view" (Polkinghorne, 1996a: 15).

The second circle is the epistemic circle, which Polkinghorne defines as follows: "how we know is controlled by the nature of the object and the nature of the object is revealed through our knowledge of it" (Polkinghorne, 1994: 32). Polkinghorne assumes a mutual conformity between the object known and the act of acquiring knowledge, and he rejects any attempt to establish a universal epistemology that is too often equated with one particular scientific discipline. Various scientific disciplines acquire knowledge of the objects of their particular discipline in their own appropriate way.[33] This leads Polkinghorne to establish the notion of the many-layered nature of knowledge, which becomes a useful argument for rejecting any form of scientific reductionism, according to which science is the only valid way to gaining knowledge – a position shared amongst naïve realists.[34] According to Polkinghorne's notion of the many-layered nature of knowledge, one and the same event can be interpreted in various ways and each interpretation is considered to be as valid as the other.[35] Arguing against any form of scientific reductionism is pivotal to critical realism as reductionism opposes any endeavour to offer theology a sort of epistemic parity with science. "A crass physical reductionism", Polkinghorne maintains, "will exclude by decree not only religion, but also the truly humane" (Polkinghorne, 1996a: 11).

However, despite the internal differences between the various layers of knowledge, the exterior of each layer shows a high level of similarity, due to the Polanyian framework in which Polkinghorne embeds his view of science. According to Polkinghorne, "science is not radically different from other forms of human rational inquiry. It too requires the act of intellectual daring, of commitment to a potentially corrigible point of view. It too involves reliable but unspecifiable acts of judgment" (Polkinghorne, 1996b, 18). Personal involvement is present in every endeavour to acquire knowledge. Science is thus not blindly perceiving raw data,[36] but it requires

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[33] See e.g. the differences in gaining knowledge between applied sciences and social sciences. Furthermore, we have addressed this idea of 'no single epistemology' in Chapter 3 'Critical Realism and Epistemology', p. 101ff.

[34] In *Beyond Science*, Polkinghorne brings forth a rather interesting argument for explaining the many-layered nature of knowledge and reality. Polkinghorne grounds his argument for the many-layered nature of knowledge and reality in a theological argument, maintaining that knowledge and reality are many-layered due to the created origin of reality. According to Polkinghorne, "behind the scientific order of the universe is the Mind of the Creator"; what is more, he believes that "the grandest Unified Theory, the true Theory of Everything, is provided by belief in God" (Polkinghorne, 1996b, 112).

[35] Padgett, among others, takes a similar stance concerning the notion of the many-layered nature of knowledge. See e.g. Padgett, 2003: 24-28.

[36] As Polkinghorne puts it, neither in science nor in theology will we derive much insight from simply staring at raw data" (Polkinghorne, 1996a: 15).

the active participation of scientists in their research, selecting what to examine and how to study it as well as the ongoing construction of new theories. Participatory elements are, in other words, always present in the scientific enterprise, be it that the scientist may only be subsidiarily aware of these elements. Scientists are, in Polkinghorne's account, considered to be passionate and experiencing human beings that seek to make sense of physical world.

But are critical realists, such as Barbour and Polkinghorne, not proposing a position that is deeply relative? Even Polanyi's epistemology of the personal has been accused of sheer relativism. In order not to fall into the pitfall of mere subjectivism or relativism, critical realism introduces the notion of 'universal intent' – a phrase coined by Polanyi. [37] On the one hand, Polanyi and critical realists maintain, the scientist is demonstrating dedication and passion, being committed to pursuing the truth, and simultaneously holding what he or she believes to be true with universal intent. A helpful definition of this notion of universal intent can be found in Rolston, who puts it as "a setting aside of private interest so as to promote the single-minded discovery of public truth, what is true at large and for all persons" (Rolston, 1997: 17). As being part of the scientific community, the scientist is subjected as it were to fellow scientists. The existence of and the confrontation with this community of fellow scientists can be seen as a weight upon the scientist that comes from the outside, demanding the scientist to act responsibly and to look beyond purely private interests. Contrary to defining objectivity in terms of scientific detachment, it is actually a commitment to universality and the presence of fellow scientists that averts the scientific enterprise from being a purely subjective discipline.[38]

Finally, as a by-product of his argument, critical realists have found in Polanyi a significant proponent for accommodating the justification of religious knowledge in a scientific era, even though it was evidently not Polanyi's primary intention. Polanyi's criticism of the damaging split between the object and subject, as suggested by the naïve realist view of science, and the rehabilitation of the role of belief and commitment in all rational activity paved the way for various attempts to show the analogous nature of science and theology. In the words of Torrance, who judiciously

[37] See e.g. Polanyi, 1958: 300-303.
[38] The role of the scientific community will be explored in the following chapter, Chapter 6 'The Humanisation of Science: The Scientist as Communal Being'.

summarises the pivotal role of Polanyi for the Christian tradition in general and critical realism in particular:

> [n]ot only has [Polanyi] helped to release Christian faith from pressure by the conception of the universe as a closed mechanistic system of cause and effect, but he has shown us that in the most rigorous scientific activity the human mind cannot operate outside a framework of beliefs which, though formally unprovable, play an essential role in guiding the thrust of inquiry into the hidden meaning of things (Torrance, 1980: xvi).[39]

Polanyi, thus, provides a far-reaching opportunity for critical realism. Whereas the logical empiricist's tradition considered theology and science as opposing to one another, where all religious knowledge is seen as meaningless, it is the work of Polanyi that enables critical realism to disprove the facile assumption that science is a mere objective discipline whilst theology is considered to be an entirely subjective one; what is more, Polanyi provides a framework for regarding science and theology as complementing one another.

5.4 Critical Realism and its Campaign against Naïve Realism in Science

As discussed in the previous sections, critical realism embeds its critique against more mechanical views of the scientific enterprise in Hanson's rejection of any theory-free or theory-neutral observations and Polanyi's notion of the personal participation of the knower in the process of acquiring knowledge. It is in particular the recognition of the rooting of all acts of knowing in interpreted experience, which is seen as a reliable guide to physical reality, that is considered to be pivotal to the critical realist attempt to attack opposing positions. Scientists are not disengaged and dispassionate observers, but they are seen as actively engaged in the acquisition of knowledge, maintaining various metaphysical, epistemological, and sociological assumptions that influence the scientist's endeavour. As a result, scientific theories do not simply mirror

[39] For an analysis of the influence of Polanyi on Torrance, see McGrath, 1999: 228-232. Of particular interest in this section is McGrath's criticism of Colin Weightman, who explored Polanyi's influence on Torrance in his *Theology in a Polanyian Universe: The Theology of Thomas Torrance*, as misconceiving Torrance's subtler appreciation of Polanyi.

reality, because there is a sophisticated and subtle interplay between the knower, the conceptual framework used and the thing known in every act of acquiring knowledge.

These arguments are held against the epistemic optimism of the common image of science, i.e. naïve realism, which is rooted in the logical empiricist's tradition and which became more popularised by the efforts of various present-day science popularisers who all share an emphasis on the championing of reason and the logical above everything else. According to this optimistic view, science is able to answer satisfactorily everything, putting, among others, all the present and future scientific, religious, and ethical controversies to an end. In doing so, the scientist is considered to disregard any sociological, psychological or historical factors influencing the scientist as well as any epistemological or ontological assumptions underpinning one's endeavour.

Critical realism, then, is on a campaign, as it were, to reject any form of naïve realism, grounding their attack on the belief that science cannot instate itself as having any cognitive primacy over other forms of knowledge. Science, critical realism maintains, is not profoundly different than other disciplines as it is considered to be one form of human rational inquiry amongst many other forms. As a consequence, then, science is seen as potentially complementary to these other forms of inquiry, including but not limited to religious inquiries. This state of affairs offers an excellent opportunity for critical realists to reinstate theology as a discipline – amongst others – that is complementary to science. With their rationale in hand, grounded on the 'new philosophy of science', critical realists set out to establish their view that theology is able to ward off the various criticisms stemming from naïve realism, which explains why critical realists are overwhelmingly concerned with providing in their eyes a sound understanding of science. As Polkinghorne puts it,

> the recognition of a role for judgment in the scientific enterprise, a tacit element not wholly reducible to the application of rules specifiable a priori, gives it a kindred character to aesthetic, ethical, and religious thinking. Many have asserted these latter modes of thought to be of a different and inferior kind, matters of mere opinion. We now see that what is involved in the comparison is a question of degree rather than an absolute distinction (Polkinghorne, 1986: 21).

If it is indeed a question of degree rather than a difference in kind, as Polkinghorne asserts, then there is still a significant opportunity to justify religious belief and theological reflection in a scientific era.

However, the set of arguments that critical realists use to ground their attack on scientific optimism is as yet insufficient. Whilst the above have been particularly concerned with the individual level of the scientist as experiencing, constructing and evaluating human being, this individual is also part of the wider scientific community, which plays a significant part in informing the way the individual experiences, constructs, and evaluates physical reality. It is in this scientific community that the scientist transcends, as it were, his own subjectivity, as alluded to in the previous sections here above. The scientific community provides a context for sharing and validation of *inter alia* certain presuppositions, expectations, attitudes and a common language, "which encourages its members to construe reality in particular ways, and which create contexts within which certain kinds of statements are perceived as making sense" (Wright, 1992: 36). Therefore, let us continue our quest for understanding the philosophy of critical realism by adding another argument to the so-called 'critical realist's arsenal' against naïve realism, where an emphasis is put on the critical role of the scientific community in the process of acquiring and validating scientific knowledge.

CHAPTER 6

THE HUMANISATION OF SCIENCE

The Scientist as Communal Being

In the previous chapter, Chapter 5, we have examined the notion of the human knower as experiencing being, emphasising the contribution of the individual knower to the process of acquiring (scientific) knowledge. Science, according to critical realism, is not a dispassionate or disinterested activity, governed by mere logical or mechanical processes, but it is rather the opposite. Science is considered to be an active participation of the knower, sometimes even rather illogical, in the process of exploring physical reality. Underpinning this view of active participation is the critical realist's endeavour to reject naïve realism regarding the scientific enterprise.

But the experiential dimension of science does not offer the full story of science and its practice. Whilst Chapter 5 was concerned with the scientist as individual knower, this chapter (Chapter 6) will explore the fundamental influence of the scientific community on the 'scientist-as-individual', along with historical and psychological factors. Science, according to critical realism, is thus not only an individual activity; it is also social and communal, making the acquisition of knowledge both a collective and an individual matter.

Before delving into the critical realist's understanding of the sociological dimensions of scientific knowledge, historical foregrounding is necessary in order to set the backdrop of the historical turn in philosophy of science. (Section 6.1) Central to the emergence of the historical turn is a critical stance towards logical empiricism and their views on the demarcation between the context of discovery and the context of justification. Proponents of the historical turn emphasised the relevance of the context of discovery to the philosophy of science, indicating the importance of the historical studies of science in showing that philosophy of science has an actual subject matter. Yet, these historians not only identified and recorded general patterns in the scientific progress, but they also proposed explanations of these general patterns. Kuhn and Lakatos will be used to illustrate this, because both philosophers have been especially significant for the development of critical realism. All this then will lead to

a comprehensive analysis of views of critical realism on the sociological dimensions of science, which is regarded as salient to the critical realist's endeavour to repudiate any dehumanised – or naïve – views of science (Section 6.2). After this, we will explore a more recent branch of this historical turn, the Sociology of Scientific Knowledge (SSK), because SSK offers us an example that seems to take the sociological dimension a bit too far compared to critical realism (Section 6.3). According to the strong programme of the SSK, epistemic factors should actually be regarded as social factors, arguing that scientific knowledge is essentially a social product and reality in some way constructed. Yet, despite a number of preliminary parallels, the SSK's claim that reality is socially constructed seems to differentiate the SSK from critical realism. Finally, some concluding remarks will be offered in Section 6.4.

6.1 Post-Logical Empiricism and the Historical Turn

The accumulation of foundational problems with logical empiricism opened up various opportunities for reconciliation between the post-positivistic philosophy of science and the study of the history of science.[1] Logical empiricism became more ahistorical as it developed over time, which brought about a parting of the ways between the historical study of science and philosophy of science. An important factor for this separation of history and philosophy of science has been the demarcation between the generation of scientific ideas and its validation, i.e. the distinction between

[1] Illustrative for this rapprochement is Lakatos assertion that "philosophy of science without history of science is empty; history of science without philosophy of science is blind" (Lakatos, 1970a: 91). However, Kuhn envisioned a rather different relationship between philosophy of science and history of science. Whereas Lakatos held that the relationship was symmetrical, Kuhn argued for a historical philosophy of science, rather than a history and philosophy of science, assuming that the relationship between history of science and philosophy of science was based upon an asymmetry. According to this asymmetrical relationship, the historians of science merely inform philosophers of science by providing these philosophers with a historically accurate representation of science to practice their trade. In other words, whilst philosophy of science, according to Kuhn, needed the historians of science, history of science might be just fine without any philosophy of science.

Another engaging view on the rapprochement between philosophy of science and the historical studies of science is Hacking's proposals of 'styles of reasoning', which is less integrative in its approach compared to Kuhn. In the Kuhnian framework, the historical studies of the sciences are primarily used to derive a generic understanding or model of its historical development. Hacking, on the other hand, infers that the notion of 'style' should also be scrutinised in terms of its philosophical validity. Whilst Hacking agrees with Kuhn that the philosopher of science requires the historian, he also emphasises the fundamental differences between the two 'styles of reasoning', indicating the necessity for the philosophy of science to exploit the historian's work in the context of their own issues and debates. See Hacking, 1992.

the context of discovery and the context of justification.[2] Despite various debates about how the distinction between discovery and justification should be drawn,[3] there seems to be a common understanding that the context of discovery is concerned with the process of developing a theory, whilst validation is part of the context of justification.[4] For several decades and due to the discovery-justification distinction, philosophy of science has shown a great deal of interest in the normativity of scientific theories, causing the context of discovery – and thus historical studies – to fall outside the scope of philosophy of science.

However, the context distinction has received sharp criticism in various ways from the 1960s onwards, leading to the rejection from other approaches to science of this narrow demarcation of philosophy of science. One particular line of critique concerned the exclusion of sociology and the historical studies of science, accusing philosophers who endorsed the narrow demarcation of philosophy of science of lacking any historical and sociological sensitivity.[5] In criticising this assumed narrow view of philosophy of science, various eminent figures of the historical turn in philosophy of science, such as Burtt, Collingwood, Butterfield, Kuhn, Lakatos, and Feyerabend,[6] explored the possibility of a philosophy of science that has been particularly informed by historical studies. Proponents of the historical turn emphasised the pivotal importance of history of science in showing that philosophy of science has a subject matter, i.e. that the descriptions of philosophers of science apply to some actual scientific practice. In their understanding of the relationship between philosophy of science and its historical counterpart, historical studies of scientific development foregrounds as it were examinations into the justification and logical structures of

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[2] Salmon, for example, remarked that the context distinction was "a major focal point for any fundamental discussion between history of science and philosophy of science" (Salmon, 1970: 70).

[3] See e.g. Schickore and Steinle, 2006.

[4] According to Schickore and Steinle, the context distinction has served two important purposes, (Schickore and Steinle, 2006). First and foremost, the distinction has been used to define a demarcation between philosophy of science and non-philosophical approaches to science, such as historical, sociological and political approaches. Science, according to the proponents of this so-called narrow view of philosophy of science, is merely concerned with the uncovering of the structure and validation of scientific theories and the logical relationship between evidence and theory as logic was considered to be the native discipline for philosophers of science. Secondly and consequent upon the first, the context distinction implied the absence of logic in the context of discovery and, therefore, the process of discovery is dismissed as being more or less irrelevant for the philosophical studies of scientific studies. The context of discovery, in other words, is seen as a mere subject matter for historians, sociologists, and psychologists, demarcating it from philosophy of science. See Schickore and Steinle, 2006.

[5] See e.g. Kuhn, 1970: 8-9.

[6] See e.g. Burtt, 1954; Collingwood, 1945; Butterfield, 1957; Lakatos, 1970b; Feyerabend, 1975.

scientific theories. Rather than being opposed to historical data, philosophical views concerning the justification of scientific knowledge should be derived from historical examples of scientists practicing their trade.

The main task of the historians of science, then, is to provide a model or framework for the development of scientific theories, which is thus based on the practice of scientists. This framework then is both a recording and identification of general patterns in the various epochs of the scientific community and an attempt to explain the identified patterns. Two philosophers of science have been particularly influential in providing such a framework, and they are also widely used in the science-theology exchange, namely Thomas Kuhn and Imre Lakatos. In the following sections, we will very briefly explore both thinkers.

6.1.2 The Kuhnian Framework

Kuhn's suggested framework for understanding scientific progress is considered by many as the best-known framework for reconciling historical studies with philosophy of science. Supported by numerous historical case studies, the general identified pattern of the Kuhnian framework is the cycle from normal science to the emergence of a new paradigm *ad infinitum*, with a crisis and a pre-paradigm phase as transitional stages. Against the mechanical-like accumulation of knowledge of more naïve accounts of science, Kuhn emphasised the pivotal importance of values as well as psychological and sociological factors in the adoption or rejection of new scientific paradigms. Observation and experience are part of the process of deciding whether to reject or to adopt a particular paradigm, but there are more arbitrary factors at play as well, such as physiological and sociological factors influencing the decision.[7] In understanding a certain historical epoch in the developments of science and its dominant paradigm, external factors, such as social forces and historical factors, should therefore also be taken into consideration.

Central to Kuhn's framework are the notions of 'paradigm' and 'paradigm change', which he uses to explain the cyclical transition from normal science to the 'new' normal science.[8] Kuhn considers paradigms to be the critical explanatory constituent of the scientific community and, out of a variety of uses of the term 'paradigm', he

[7] See Kuhn, 1970: 4-5.
[8] Kuhn used the word 'normal' science for scientific research that takes place within the then-dominant paradigm.

distils it into two particular usages in the *Postscript* of his *The Structure of Scientific Revolutions*.[9] In the broad sense, the notion of paradigm concerns a consensus about various significant elements of scientific practice, which he called a 'disciplinary matrix'. The disciplinary matrix consists of *inter alia* guiding theories, instruments, metaphysical assumptions, and mathematical equations. Kuhn considers the commitment to the disciplinary matrix as a pre-requisite for the normal sciences, a commitment that is influenced by various factors, including historical and sociological ones. The narrower meaning of paradigms, on the other hand, considers one particular component, i.e. the exemplar, of the disciplinary matrix as the paradigm. An exemplar might be a significant scientific solution to the more serious anomalous puzzles that affect the normal science.[10] In a scientific revolution, then, the disciplinary matrix undergoes a significant revision, causing the scientific community to undergo a shift in how to see the physical world.

Contrary to the logical empiricists and the accounts by science popularisers, who considered the inferential relationship between scientific theories and physical evidence to be a mere logical matter, Kuhn suggested an alternative view to scientific evolution that was less concerned with rigid logic and rule-governance. As Ladyman puts it, Kuhn emphasised "the intellectual property of social groups whose rules and conventions are to be found, not just in their textbooks and theories, but also in the nature of funding bodies, research and educational institutions, the review boards for learned journals and so on" (Ladyman, 2002: 105). For Kuhn, scientific progress is often arbitrary and chaotic in nature, and there are often other factors at play in shifting from one paradigm to the other.

6.1.2 Lakatos and the Historical Turn

Another proponent of the historical turn that has been particularly relevant for the science-theology dialogue in general and critical realism in particular are the explanatory elements in the work of Imre Lakatos.[11] Lakatos regarded Kuhn's

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[9] See Kuhn, 1970: 181-191.

[10] Kuhn provides several examples of what he considers to be exemplars: Aristotle's analysis of motion, Ptolemy's computations of planetary position, Lavoisier's application of balance, and Maxwell's mathematisation of the electromagnetic field (Kuhn, 1970: 23).

[11] For the science and theology dialogue, see e.g. Hefner, 1988; Peterson, 1988; Murphy, 1990; *idem*, 1999, Peters, 1992. For critical realism, see e.g. Barbour, 1974: 101-102; *idem,* 1997: 132-134; Polkinghorne, 1996b: 16-17. In particular Murphy has tried to use the Lakatosian notion of research programmes in order to explain the relationship between science and theology. Yet, whilst still endorsing several aspects of Lakatos' views of science, Murphy has recently shifted towards the work

examination of scientific change as irrational – "*a matter of mob psychology*" – because Kuhn suggested that rules of rationality have no significant role in science and the seeming relativism in his account (Lakatos, 1970b: 179).[12] Whilst recognising the force and validity of Kuhn's identification and recording of the general patterns in history of science, [13] Lakatos turned to Popperian falsificationism in order to rescue the rationality of science from Kuhn's relativistic inclinations.[14]

Central to Lakatos' alternative view of the organisation of science is the notion of research programmes, which functions as the explanatory element of Lakatos' theoretical history. A research programme is essentially a complex constellation of primary hypotheses, theoretical assertions, auxiliary assumptions, and relevant data that underpin a particular domain of scientific inquiry. Each research programme consists of two main components, a hard core and a protective belt. Lakatos characterises the hard core as a set of leading hypotheses, mathematical formulations, and assertions that are central to the research programme.[15] According the Lakatos, the hard core is not revisable, because the negative heuristic that is pivotal to the hard core refrains the scientist from questioning the programme's hard core in the face of an anomaly. This negative heuristic redirects as it were the criticisms that stem from these anomalies to the protective belt. Whilst the hard core of each research programme is considered to be irrefutable, the positive heuristic of the protective belt then, claims Lakatos, "consists of partially articulated set of suggestions or hints on

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of the eminent Scottish philosopher Alasdair MacIntyre, informing the reader on a more biographical note that she has "evolved from being a Lakatosian to being a MacIntyrean" (Murphy, 2007: 306). Lakatos' inadequateness to respond to the Feyerabend's major criticism, according to which there is an uncertainty whether or not a degenerating research programme should be eliminated due to the fact that it might suddenly develop and become progressive in the future, is the main reason for Murphy's shift (see Feyerabend, 1975: 185). MacIntyre, on the other hand, offers adequate resources to warn off Feyerabend's criticism, Murphy maintains (see Murphy, 2007; Reeves, 2011).

[12] Italics: Lakatos.

[13] See Lakatos, 1970b: 115.

[14] Whereas logical empiricism proposed the aforementioned verification criteria as their solution to demarcating the empirical sciences from pseudo-science, Popper suggested an alternative criterion that is grounded on the notion of falsification. According to this criterion, a scientific theory can only be considered scientific if and only if one is able to conflict it with observations, falsifying the hypothesis with empirical evidence (Popper, 1962: 39). Scientific progress, in other words, is only possible through a process of trial and error. Pivotal then for Popper is the claim that "*it must be possible for an empirical scientific system to be refuted by experience*" (Popper, 2002: 18; italics: Popper). As a consequence, scientists should strive to formulate and explicate their theories and results as logically clear as possible. Science, according to falsificationism, is thus more concerned with the falsification of scientific hypotheses rather than their verification and confirmation.

[15] In his *Methodology of Scientific Research Programmes*, Lakatos illustrates the hard core by exploring the central theoretical ideas in Newton's research programme of gravitation. The hard core of the Newtonian programme consists, according to Lakatos, of the three laws of motion and the law of gravitation (Lakatos, 1970b: 133).

how to change, develop the 'refutable variants' of the research programme, how to modify, sophisticate, the 'refutable' protective belt" in the light of anomalies (Lakatos, 1970b: 135). Scientific research programmes are then considered to be successful if the adjustments, re-adjustments, and replacements to the protective belt lead to a progression within the research programme, enabling the programme to be applicable to a larger set of problems. However, a research programme is unsuccessful if the anomalies lead to degeneration, according to which the research programme is unsuccessful in extending itself to new unsolved empirical problems.

6.1.3 Critical Realism and the Historical Turn

The primary task then of a historically informed philosophy of science is to provide a framework for explaining scientific progress. Contrary to the aforementioned narrow view of philosophy of science, which dismissed the context of discovery as irrelevant for the philosophical studies of the sciences, Kuhn, Lakatos, and others have turned to history and sociology to explain scientific progress, allowing as it were the context of discovery to enter into the realm of philosophy of science. History of science, according to these philosophers, could be particularly relevant to philosophy of science. Central in their endeavour has been the appeal to the actual practice of scientists, i.e. the context of discovery, which opposes to the idea of science as an intellectual machine that acquires its knowledge in a straightforward and logical way. It is in the actual practice of scientists where we discover the mechanisms that underpin the scientific enterprise, such as the importance of local historical circumstances, values, and paradigms. Similar to Hanson and Polanyi, these philosophers and historians of the historical turn take into consideration the more human elements of science, rather than understanding science as a theory-neutral or a strictly objective discipline.

Furthermore, Kuhn, Lakatos, and others have also intended to normatively explicate what constitutes a rational or valid science. Instead of simply identifying and describing general historical patterns in the development of science, Kuhn's notion of paradigm and Lakatos' research programme propose explanations for identified patterns. Rather than historical recordings of scientific progress and the identification of general patterns in science, these explanatory elements in particular have been significant for the endeavour of critical realism to refute the dehumanised

understanding of naïve realism on the historical level.[16] As Wentzel van Huyssteen puts it,

> the Kuhnian model opens our eyes to the fact that the so-called pure sciences have much more in common with other conceptual models then could ever be recognized in a positivistic standard conception of science. In fact, what we have here is a definite relativization of the rigidity with which the positivistic demarcation question is usually formulated (van Huyssteen, 1989: 62). [17]

Contrary to the naïve realist's understanding of a linear or mechanical-like accumulation of knowledge, critical realists agree with the historical turn's emphasis on the actual practice of the scientist. Polkinghorne's assertion, for example, that science consists of numerous "false starts, blind alleys and illusory claims that characterize any form of human activity" is paradigmatic for the critical realist view of science as a human practice (Polkinghorne, 1996b: 27). Critical realists attempt to move away from an ideal and flawless understanding of science, stressing on the actual process of trial and error that is regarded as central to the life and operations of the scientific enterprise.[18] For critical realists, science should be placed – against the common image of science as the only reliable path to knowledge – on a continuum with other human activities, including theology and metaphysics, and the historical turn has given critical realism good reasons for making this argument.[19] In the

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[16] This is not to say that the historical studies are less significant in the science and theology dialogue, see e.g. Brooke, 1991; Harrison, 1998. One could argue that in particular Barbour's critical realism is more historically-informed, compared to the other critical realists, as both his *Issues in Science and Religion* and *Religion and Science* begins with an exploration into the historical issues concerning the relationship between science and theology. However, these historical events do not seem to have a significant role in Barbour's elaboration of critical realism, due to the fact that there are no references to these events. It seems to be more likely that Barbour's historical explorations are employed to underpin his endeavour to validate the interrelationship between the scientific disciplines and theology.

[17] See Paul Allen's assertion that "(…) it is really Kuhn and the historicist movement to whom Barbour gives credit for advancing critical realism in the philosophy of science" (Allen, 2006: 17). See also e.g. Barbour, 1966b: 153-156; *idem*, 1971: 93, 102-118; *idem*, 1997: 125-127; Peacocke, 1984: 17, Polkinghorne, 1986: 17-19, *idem*, 1996b: 11-12; van Huyssteen, 1989: 47-67. In addition to the science and theology dialogue, Kuhn's *Structure of Science* has received increasing attention in theology from the 1970s onwards (see e.g. Küng and Tracy, 1989; van den Brink, 2004: 260-281). Many of these theologians have found Kuhn's work particularly useful in understanding and exploring analogies between the natural sciences and theology. Of particular interest is Hans Küng's endorsement and adoption of the Kuhnian notion of paradigms as a methodology for exploring the future of theology (see e.g. Küng, 1988a; Küng, 1988b).

[18] See Barbour, 1966b: 151.

[19] See Barbour, 1966b: 151.

following section, we will take a closer look at the importance of the social dimensions of science for critical realism and their rejection of naïve realism.

6.2 Critical Realism and the Social Dimensions of Science

The historical turn received a warm reception within the critical realist literature in its endeavour to elaborate a more humanised understanding of the sciences. Whereas Hanson and Polanyi provided the basis for thinking about the scientist as an experiencing and passionate human being, the proponents of the historical turn gave the critical realists arguments that show the social and communal character of the scientific enterprise in order to demonstrate that the naïve realist stance is erroneous. The actual practice of science does not only require a passionate, intellectual, and intuitive human subject, but also a communal, social, and historically-minded subject.

Central to the critical realist attempt to elucidate on the historically and socially conditioned nature of science is the view of science as primarily a distinctive set of activities and attitudes of social groups. All scientists, claims critical realists, belong to a particular research community, and the scientific enterprise actually depends upon a shared commitment to certain fundamental beliefs and values, which guide the direction of scientific research. The acquisition of knowledge about the physical world is considered to be the core communal activity, viewing its knowledge as a collective product, and the principal motivation for undertaking this intellectual quest is the desire to know and understand why the world is as it is. [20] The critical realist's understanding of science seems to bear a close resemblance to Harold Brown's claim that "science consists of a sequence of research projects, structured by accepted presuppositions which determine what observations are to be made, how they are to be interpreted, what phenomena are problematic, and how these problems are to be dealt with" (Brown, [1977] 1979: 166).[21] As Brown points out, it is in particular the joint acceptance of certain fundamental presuppositions that are central to the research community, holding as it were the cooperative venture together. In addition to these fundamental presuppositions, scientists also share certain expectations, beliefs, languages, sets of attitudes and traditions, which become the leading framework or paradigm of a particular scientific community. This prevalent framework then

[20] See Barbour, 1966b: 149-150; Polkinghorne, 1996b: 26.
[21] See Barbour's explicit reference to Brown in Barbour, 1997: 126.

influences the lenses through which the scientist sees the world, causing all observations to be theory-laden and our knowledge claims to be scheme-dependent.

As a consequence, the scientist's mind, according to critical realism, is not a mere *tabula rasa*. On the contrary, critical realists emphasise the scientist as a historical subject, participating in a historically and culturally conditioned scientific community.[22] As participating in this community, the scientist's exploration of reality is constituted by numerous assumptions, which are both historically and culturally situated, about the physical world. In addition to various metaphysical[23] and epistemological[24] presuppositions that a scientist could hold about the physical world, an example of such a presupposition is the confidence a scientist has in the reliability of the underlying scientific theories that he uses to validate or develop his own scientific theory. In their search for the Higgs boson, the particle physicists, for instance, did not reconsider every single theory that underpins particle physics in order to validate the existence of the Higgs boson. Instead, as far as I can see, it seems to be highly reasonable to assume that those physicists grounded their results and findings on already validated theories; what is more, once the existence of the Higgs boson has been proved, no one seems to go back to re-examine its existence. Due to the high complexity and the intricate interconnected structure of scientific theories, each scientist is dependent upon, and builds upon, the framework of 'accepted' theories, which have been developed by predecessors and fellow scientists.

In addition to the interconnected nature of scientific theories, the scientific community itself is considered to be interconnected as well, according to which the participants of the scientific community, albeit with varying degrees, require each other in their endeavour to understand physical reality. The scientific community consists of a wide range of different kinds of people and their particular contributions to the life and operations of the community, whether as a theorist or experimentalist, as a journal editor or the research director. Critical realism then grants a central place to social interaction amongst scientists and other contributors to the wider scientific community in the life and operation of the scientific enterprise. Science, according to

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[22] Gilkey speaks in this context about the necessity of 'conversion' to the prevailing assumptions of the scientific community. See Gilkey, 1993: 28.

[23] These metaphysical presuppositions include, among others, assumptions about the orderliness and uniformity of nature and about what is real.

[24] Epistemological presuppositions include certain epistemic beliefs such as the intelligible nature of reality and he notion of correspondence between theory and the physical world.

critical realists, is considered to be a social activity within the wider community of scientists.

Important, then, to the scientific community is the process of learning through apprenticeship, in which the student's metaphorical 'worldview lenses' or presuppositions are formed and shaped by interaction with superiors of the community to which the student belongs. In becoming part of the scientific community, the apprentice needs to immerse himself as it were in the community's life, observing, sharing, and copying their habits, procedures, and traditions. It is through this process of familiarisation and repeated practice that the apprentice adopts the underpinning presuppositions and methods of the community. Science, according to critical realists, is to a large extent a pedagogic vehicle as the education and socialisation of the apprentice is considered to be one of the core elements of the life and operation of the scientific enterprise.

6.2.1 Barbour on the Underlying Processes of the Scientific Enterprise

The novel theories and predictions produced by this corporate enterprise cannot be construed and analysed without a comprehensive examination of the social processes sustaining these sets of propositions. It has been Barbour in particular who has spent a significant amount of effort elaborating upon the underlying processes of the scientific community. Similar to the philosophers of the historical turn, Barbour rejects the aforementioned narrow view of philosophy of science, according to which the philosophical study of science should only be concerned with the context of justification, as it portrays an inadequate picture of the scientific enterprise. The one-sided emphasis on the logic of discovery, Barbour contends, "obscure[s] insight into the slow and often tortuous way [science] has actually grown, the many false starts, plausible but fruitless hypotheses and frustrating impasses that are part of its life" (Barbour, 1966b: 151). Instead of disregarding the social and human dynamics of science, Barbour turned to the actual practice of scientists and, thus, to the context of discovery to suggest a more accurate understanding of the actual life and operations of the scientific community.

Barbour's alternative stresses the cooperative nature of science. Science is not considered to be a private matter, but its activities and operations are made possible through the mutual interaction and collaboration of scientists within the wider scientific community. A one-man science is impossible. Science requires mutual

verification and affirmation due to the limitations of the individual, and it is in the cooperation and interaction with fellow scientists that the 'lone' scientist overcomes one's shortcomings and preventing the scientist from systematic errors in his scientific research. Scientific progress is thus dependent upon the possibility for the scientist to exchange novel theories and results. For Barbour then, communicability is one of the fundamental characteristics of scientific knowledge, enabling scientists to share their new ideas and findings with the wider community of fellow scientists.[25]

Moreover, in addition to the need for feedback and criticism of fellow scientists, there are also various intrinsic needs that necessitate the social interaction with fellow scientists, such as the recognition that is credited to scientists after publishing ground-breaking results or theories. Repudiating the idealised accounts of science, which emphasise the neutrality and objectivity in science, Barbour, for example, indicates that "scientists are in fact seldom disinterested or devoted to the truth alone; like other people, they often seek professional recognition, personal success, and higher pay"; what is more, Barbour rather controversially points out that "with the emergence of the 'big science', the goals of research are increasingly set by industry or government whose objective is not truth for its own sake but knowledge as an instrument of power" (Barbour, 1993: 28). It is in this communal nature of the scientific enterprise where one thus encounters the various inhomogeneous and human characteristics that underpin the scientific enterprise, such as its adventurous as well as habitual nature, personal ambitions and the divergence in expectations, and the numerous disagreements concerning the content and meaning of its theories.

Thus, for critical realists, scientific knowledge is highly dependent upon the collective of scientists and, as such, its knowledge claims are considered to be collective knowledge. Science is not a 'one-man show', but rather it is understood in terms of collaboration between scientists. Furthermore, there are all kinds of factors at play in this collective enterprise that (might) impact the resulting knowledge claims of scientists, such as sociological and psychological factors. For critical realists, there is, therefore, a strong emphasis on the sociological dimension of science. However, more recently, others have also put forward arguments that stress the significance of sociological dimensions that underpin the sciences, with the Sociology of Scientific Knowledge (SSK) as the most overt example of this. But how does critical realism

[25] See Barbour, 1966b: 152.

relate to these developments and the SSK in particular? In the following section (Section 6.3), we will have a closer look at the SSK in order to have a better understanding of the more nuanced stance critical realism seems to take here.

6.3 Sociology of Scientific Knowledge

Inspired at least in part by the work of Kuhn, Lakatos, and others from the 'new philosophy of science', some sociologists of science rejected the idea that philosophy of science is able to reveal the underlying processes of scientific practice. The Sociology of Scientific Knowledge (SSK) group argued that the assumed separation of the social from the rational in most philosophies of science is untenable; what is more, science should be primarily understood in its social terms, replacing the rule-governed and logical structure with a sociological explanation. [26] Barnes, Bloor, Shapin and other sociologists of science, many of them associated with The University of Edinburgh, considered the building of theories to explain the characterisation of knowledge in terms of general regularities, principles, processes and social relationships as the aim of their endeavour.

Central to the programme of SSK are the social aspects of scientific inquiry itself and the distribution of scientific knowledge and the various social factors influencing this. Niiniluoto, who is has been rather critical about SSK, provides a careful characterisation of the sociological tradition by suggesting that "science (including physics and mathematics) for Bloor is 'a social phenomenon' whose methods, results, and objectivity are relative to social interests and causally influenced by social factors" (Niiniluoto, 1999: 254). The task of the sociologist then is to unravel the social roots, origins, and substructures of scientific knowledge. Proponents of SSK contested the idea that knowledge, in science as well as other epistemic territories, should be construed as true belief. Instead, Barnes, Bloor and others argued for the notion of collectively accepted belief as a more appropriate explanation for understanding scientific knowledge.[27] Rather than considering scientific knowledge as passive perceiving of individuals, the sociologists maintained that knowledge is produced by the interaction of particular social collectivities that are engaged in activities with

[26] However, Kuhn strongly repudiates the endeavours of the sociologist of scientific knowledge in claiming that "I am among those who have found the claims of the strong program absurd: an example of deconstruction gone mad" (Kuhn, 1992: 9). Others have also been particularly critical about the endeavours of SSK. See e.g. Laudan, 1977; Hollis and Lukes, 1982; Brown, 1989; McMullin, 1992.
[27] See Barnes, 1977 [2014]: 2; Bloor, 1976: 5.

specific problems and aims. Pivotal then to the Edinburgh School are the extra-scientific conditions that bring about certain states of beliefs and ideas.

As a consequence, a tendency towards social constructivism is apparent, due to the fact that the proponents of the strong programme argue for the constitutive nature of general regularities to the content of scientific knowledge. Scientific theories thus are not derived from reality, but rather imposed upon it, disclosing the constructivists tendencies in the sociologist's understanding of the scientific enterprise. In imposing scientific theories upon reality, various extra-scientific commitments, construed in social terms, that the scientist holds, are considered to be decisive in explaining the formation of the content of scientific knowledge. These commitments, according to Barnes and Bloor, should be understood in social terms. This led to a general understanding of the Edinburgh School as continuing the externalist tradition in the history of science, according to which external circumstances, such as political, economic, or social, affect the scientific endeavour of acquiring knowledge.[28] Illustrative for this externalism is, for example, Bloor's suggestion that "there is much evidence that features of culture which usually count as non-scientific greatly influence both the creation and the evaluation of scientific theories and findings" (Bloor, 1976: 6). Contrary to the externalists, the internalist approach studies the intellectual or intra-scientific aspects of the scientific pursuit, such as methodological procedures, available evidence, conceptual frameworks, and mathematical formulations. External factors, according to internalists, are thus considered to be irrelevant for the shaping of the content of scientific knowledge. A paradigmatic example against the externalist tendencies in the strong programme has been mathematics, which seems to defy any attempt to define mathematics as a contingent social product. Mathematical equations, such as 2+2=4, are considered to be the exemplar of the absence of any sociological factors. Yet, Bloor and others challenge such a characterisation of mathematics by pointing out that sociological considerations do have a central role in mathematical proofs.[29] They suggest that, for example, the meaning of mathematical symbols is context dependent and established by certain social conventions, allowing for a social interference with the assumed socially-neutral mathematics. Therefore, even in mathematics there are external sociological factors at play.

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[28] See e.g. Barnes, 1974:99-124; Shapin, 1992.
[29] See Barnes, Bloor, and Henry, 1996: 169-199.

After the initial efforts of Barnes, Bloor and Shapin to elucidate the social dimensions of scientific knowledge, the field of sociology of science began to diversify, exploring new areas of interest such as that of feminist approaches to the sciences. One particular intriguing trend has been towards so-called 'micro-sociological' studies, examining ethnographically the daily processes of scientific work in laboratories.[30] Similar to an anthropologist who studies foreign cultures, these ethnomethodological studies examine the actual construction of knowledge in the scientific community. Underpinning their 'micro-sociological' studies is the strong inclination towards constructivism, which these ethnographers share with the Edinburgh School, arguing that scientific reality is constituted by socially conditioned laboratory practices.[31] Scientific objects, in other words, do not exist prior to their discovery as these objects are constructed in the laboratories.

6.3.1 Critical Realism and SSK

Since both critical realism and SSK put a strong emphasis on the sociological factors that underpin scientific practice, should we understand critical realism as something akin to SSK? Interestingly, a number of critical realists have explicitly distanced themselves from SSK. Polkinghorne for example points out that "we can readily agree that (…) social forces can retard or accelerate the pace of scientific discovery, but there are no grounds at all for going to assert that they actually control the nature of that discovery" (Polkinghorne, 1986: 20). Whilst external factors have a role to play in science, there are intra-scientific factors that are very significant in the process of making a scientific discovery and formulating scientific theories.

Also rejecting SSK, Peacocke considers this branch of philosophy as representing an "antirationalist" account of science (Peacocke, 1984: 22). What does Peacocke mean with 'antirationalism'? Relying on the work of McMullin, Peacocke points out that there are crucial differences between science as a social product and most other such products.[32] Important here for Peacocke is the notion of genuine 'scientific progress', which is neglected in the relativistic account of SSK. As Barnes puts it,

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[30] The aforementioned work of Latour and Woolgar is a classic example in this genre, where they describe how they became part of the Roger Guillemin's neuroendocrinology laboratory at the Salk Institute for Biological Studies. See Latour and Woolgar, 1986; Knorr-Cetina, 1981.

[31] Yet, Latour has been vehemently critical towards the Edinburgh School. For an overview of Latour's criticisms and a reply from the Edinburgh School, see Bloor, 1999.

[32] See Peacocke, 1984: 21.

> Progressive realism is one of the ideal accounts of scientific knowledge which has it moving towards something, in this case a description of the real existing mechanisms in the world. There are now several independent strands of work which imply that such theories are misconceived, and that all knowledge generation and cultural growth should be regarded as endlessly dynamic and susceptible to alteration just as is human activity itself, with every actual change or advance a matter of agreement and not necessity (Barnes, 1977: 24).

Although SSK recognises the possibility of change, genuine progress is not possible. However, Peacocke is particularly critical of such a stance, maintaining that "scientists have proved progressively more and more successful in predicting and manipulating the physical world, and, increasingly, also the biological" (Peacocke, 1984: 21). We cannot only ascribe external factors to theory change, where theory *a* is substituted with theory *b* because of political, economic, or social reasons. On the contrary, progress is made because some parts, e.g. methodological beliefs or some truth-content, of theory *a* are preserved in theory *b*. As such, our current scientific theories capture more truth about the physical world than previously held theories. As Peacocke puts it, current scientific theories do not capture "*all* truth, just *more* – even if this 'more' is only a miniscule increase, it is enough to ensure growth in the scientists' ability to predict and control" (Peacocke, 1984: 21-22).[33] Hence, there are intra-scientific factors at play that are significant for determining whether or not scientific theories are increasingly becoming more accurate.

Therefore, for critical realists, it is indeed the case that social factors are always present, making our knowledge claims of reality scheme-dependent. But these social factors are not sufficient for explaining the acceptance of certain scientific theories as true or truthlike and the resulting progress in science. Not everything, according to the critical realist, can be explained in social terms. Whereas externalists, and in particular the proponents of the Edinburgh School, hold that epistemic factors which supposedly establish the truth-value of scientific theories are actually social factors, critical realists seem to reject this notion of the SSK. Intra-scientific factors, such as the available evidence or mathematical formulations, are significant to science and offer science a

[33] Italics: Peacocke.

rationale.[34] Due to these intra-scientific criteria, critical realists thus do not go as far as to infer that the scientific enterprise in general is unreliable for generating true or truthlike theories, despite the fact that social and historical factors do indeed influence the scientific practice.[35]

6.4 Concluding Remarks

Hanson, Polanyi, Kuhn and others have provided a framework for critical realism to elaborate upon the non-scientific basis of science. Whereas Hanson and Polanyi have pointed critical realists towards the individual knower as participating in the acquisition of knowledge, the historical turn has provided a very relevant vocabulary to define science as historically and socially conditioned. Science is considered to be a corporate enterprise. As such, science is not grounded on sheer logical considerations and mechanical processes; on the contrary, sociological and historical presuppositions influence the scientist, giving science a more human character. Science and its knowledge, critical realists maintain, should be understood as a social product of collaborative attempts to understand the physical reality. As Peacocke puts it, "the co-operative character of its inquiries and the role of the free community of scientists in transmitting new paradigms, concepts, models and hypotheses, and in formulating criteria of judgment, are absolutely essential to science"; what is more, "scientific work would be impossible but for the existence of this community characterized by value judgments, even if these are implicitly assumed rather than explicitly enforced" (Peacocke, 1971: 15). For critical realists, science is thus a social endeavour, having, among other things, its own ideals, conventions, language and jargon, creeds and beliefs, as well as its politics, schisms and fashions. "All scientists", Polkinghorne maintains, "are inheritors of a tradition and members of a community" (Polkinghorne, 1996b: 23). It is the scientific community that provides the relevant framework for scientific research, allowing the individual knower to responsibly act within the wider community.

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[34] Barbour, for example, distinguishes four intra-scientific criteria for evaluating scientific theories: (1) agreement with data, (2) coherence, (3) scope, and (4) fertility, whilst not mentioning any social factors (Barbour: 1997, 109) See Barbour, 1966b: 144-145, where Barbour only mentions the first three criteria.

[35] For a scientific realist perspective, see Papineau, 1988: 51. Barbour makes a similar argument in claiming that "science does offer reliable procedures for testing and evaluating theories by a complex set of criteria" (Barbour, 1997: 110).

The endorsement of the socially and historically conditioned science leads critical realists to conclude that there is no theory-free or theory-neutral science. Scientists are actively engaged in and contribute to the pursuit of understanding physical reality. The rejection of a theory-free or theory-neutral science is probably – as far as I can see – the most important tenet in the struggle of critical realism with naïve realists' views of science. Scientists do not simply perceive raw data in front of them and objectively develop new theories that directly correspond with physical reality. On the contrary, critical realism portrays scientists as active participants of a historically, culturally and socially conditioned enterprise in the pursuit of acquiring scientific knowledge.

But underneath the critical realist's rejection of theory-neutrality in the sciences and thus naïve realism seems to lie a deeper and greater intention. Their view of science as a theory-laden activity allows critical realists to reject the naïve realist view of science as having any epistemic primacy over other epistemic territories, allowing them to put the sciences on an epistemic continuum with other disciplines, such as theology. Science, critical realism maintains, is not the only way to knowledge. On the contrary, there are a plethora of valid ways to acquire knowledge about the world, including – and this is particularly relevant for the critical realists – religious efforts to understand and explain reality. Gilkey judiciously illustrates this point in maintaining that

> science is subject-dependent. And because the knowing subject is himself culturally and historically dependent, science – that is, the theoretical structures of science – has become (like the symbolic constructs of religion) in part a function of wider cultural and historical change, not the self-sufficient and steady accumulation of objective knowledge it once thought itself to be (Gilkey, 1993: 29).

In its life and operations, the scientific community shares many similarities with other communities in the wider society and these other communities might have had a profound influence upon the emergence and growth of science.[36] If this is true, then science cannot claim any epistemic primacy over other forms of knowledge acquisition.

[36] For example, Schilling indicates that "there can be no doubt that the reasons for accepting hypotheses, theories, concepts, or modes of thought within science have often been political, social, economic, philosophical, or theological in nature and origin" (Schilling, 1958: 1326).

Hence, the scientific way of understanding and ordering reality is one particular form of ordering that is set within a wider, fundamental human inclination to grasp reality around them. As a result, science cannot instate itself as having a certain cognitive primacy over any other form of knowledge. Each form of knowledge, according to Gilkey, "represent[s] experienced encounters with reality that result[s] in knowing something of what is encountered" (Gilkey, 1993: 37). It is particularly this second conclusion that enables critical realists to reinstate religion in general and theology in particular as a discipline complementary to science, given that both disciplines encounter the same reality in their own way.

Illustrative for this tendency to define the relationship between science and theology in complementary terms is Nicholas Saunders' account of the interplay between science and theology. In explicating his methodology of *Divine Action and Modern Science*, Saunders claims that

> Nevertheless it remains the case that *both* theology and science make overlapping truth claims about the same reality, namely the nature of God's creation, and thus it is critical that our theological doctrine, claims and understanding must be examined against the wider criteria of coherence with what we know from science, and similarly that what we know scientifically should be considered in the light of, and tested for coherence with, our current theological understanding (Saunders, 2002: x).[37]

Scientific controversies, according to Saunders, provide far-reaching opportunities for theology to mingle in these debates, in particular the underpinning philosophical middle ground. Saunders suggests that there might well be a significant opportunity for theology, for example, to engage in the measurement problem in quantum mechanics in that it might be necessary to reconsider or reject various approaches to resolve this measurement on theological grounds.[38]

Two movements in philosophy of science have formed the backdrop against which critical realism has been developed, namely the scientist as experiencing human being and the communal elements of scientific practice. Using the rationale of the 'new

[37] Italics: Saunders.
[38] See e.g. Saunders, 2002: x; 127-172.

philosophy of science', critical realism creates an optimistic scenario for the rehabilitation of theology as a proper academic discipline. Or, as Roger Trigg puts it: "while science retains considerable intellectual authority, its own philosophical basis has become more problematic. Some have seen this as an opportunity for religion to re-establish its credentials" (Trigg, 1998: 77). However, providing a more human accounting of science is not sufficient for critical realists to warrant the complementary relationship between science and theology, because critical realists also use the insights of the 'new philosophy of science' to depict a more scientific theology. Let us now turn to and evaluate the views critical realists have put forward with regard to theology in the following chapter.

CHAPTER 7

THE SCIENTISATION OF THEOLOGY

A Critical Realist understanding of Theology

In this chapter, I set out to examine the validity of the critical realist's endeavour to scientise theology and its method.[1] After some introductory remarks (Section 7.1), I first draw the contours of the critical realist scientific theology, starting with creating a common ground between their thinking about the sciences and theology (Section 7.2). After this foregrounding work, an exposition of the critical realists' stance on theology will be provided, with a particular emphasis on their methodological considerations (Section 7.3). As this discussion of the theology of critical realism will show, there are clear similarities between their philosophy of science and their views on theology, and it is this rather one-directional approach from the sciences to theology that seems to cause certain cracks in the critical realists' reflection on theological matters (Section 7.4). In Section 7.5, we will explore a number of these cracks, such as theological anthropomorphism and the rather unhelpful bottom-up/top-down dichotomy. This chapter, then, concludes with a recognition of the richness of the theological discipline, which serves as a more nuanced stance to the rather narrow focus of critical realism (Section 7.6).

7.1 The 'Existential Crisis' of Theology

Due to the epistemological, predictive and technological success of the sciences, the idea of theology as having any epistemic validity amongst the sciences has been severely challenged. Science and its rigorous methods have become the hallmark of knowledge; what is more, science is considered by many as the only valid way to acquire knowledge. Claiming that *x* has been proven by scientists or that the scientific method has been applied to study *x* implies that the assertion about *x* has authority and is reliable. This optimism about the capabilities of science has led to the dominant

[1] This chapter then is not concerned with particular views shared amongst critical realists with regard to theological doctrines and dogmas, such as Christology or soteriology, but the focus lies on the theological method as such. For an engagement of critical realism with a number of core beliefs of the Christian tradition, see e.g. Polkinghorne, 1994.

belief that there are no real limits to science, and other forms or modes of knowledge are placed alongside the sciences to determine the validity of its respective existence. Existential questions that traditionally belonged to philosophy and theology, such as the reason for our existence or the meaning of life, are pulled into the context of science, where the methods of science are presented as the only alternative to these disciplines which are often disparaged as superstitious disciplines. As a consequence, there has been an increasing scepticism with regard to the credibility of theology as an academic discipline.

Well aware of the increasing optimism about the epistemic reputation of science, critical realists have set out to demonstrate the credibility of theology and – for some – to reinstate theology to its historical position as the 'queen of sciences'.[2] There are two lines of arguments that critical realists suggest in 'reviving' theology. First and foremost, as explored in Chapters 5 and 6, the arguments regarding the rather subjective elements involved in scientific practice, over and against the scientific objectivism of naïve realism, have played a significant role in establishing the validity of other modes of knowledge. The aforementioned conclusion of Gilkey is helpful here, where he states that "the view of science that I criticize (1) sees science as the only way to know reality and so the only responsible means for defining reality for us and (2) views the results of science as providing an exhaustive account of reality or nature and hence leaving no room for other modes of knowing, such as aesthetic, intuitive, speculative, or religious modes" (Gilkey, 1993: 2). Scientific findings as such are not so much at stake, but critical realists reject the assertion, grounded on these scientific findings and shared amongst science popularisers, that science has any epistemic primacy over other forms of knowledge or that science is the only valid way of acquiring knowledge.

Second and consequent upon the first, critical realists move from endorsing a critical realist's understanding of science to a potentially constructive application of critical realism in the field of theology in order to reinstate theology. Critical realism is uncritically transferred from the sciences to theology, where critical realism is understood in terms of offering a rationale for systematic theologians to explore the epistemological foundations of theology. Wentzel van Huyssteen, who endorsed

[2] See e.g. Gregersen's analysis of Peacocke's *Theology for a Scientific Age* for such a reinstatement of theology as the queen of sciences by suggesting a hierarchical order within academia (Gregersen, 2004: 89-90).

critical realism in its early years, vividly describes critical realism as providing a promising conceptual model

> for systematic theology which will ultimately serve not only theology in its apologetical discourse to the outside but also systematic theology itself, by critically analysing its theorizing as a process ultimately of creative, conceptual construction (van Huyssteen, 1989: xi).[3]

Critical realism is about offering a framework that allows theologians to reflect on the justification of their own discipline in a context that is dominated by the successes of the (natural) sciences. A theology that bears a close resemblance to the sciences helps critical realists in their endeavour to restore to theology the position it has had in previous centuries.

In giving theology a more scientific outlook,[4] the constructive application of critical realism from the sciences to theology leads to the direct influence of philosophy of science on theological practice, where differences between both disciplines are a matter of degree rather than kind. As Barbour puts it, "I see differences of degree rather than an absolute dichotomy" (Barbour, 1974: 6). These differences are put on a scale of degree, where, for example in the context of semantics, scientific language is understood as being less metaphorical than religious semantics. Or, religious models have certain additional functions that are not present in scientific practice, such as the evoking of awe or encouraging certain attitudes towards life. But at the same time, despite these differences, religious language is considered to bear key similarities with scientific language; what is more, scientific language could even be used to improve the position of theology. As Soskice puts it, "the argument in this apology tends to be *de facto*, to suggest simply that there are these similarities in the use of models in science and religion and that therefore religion need not be ashamed to use models or even to rely on them, since natural science proceeds in the same way" (Soskice, 1985: 104). Yet, the question arises whether such a direct influence is actually helpful for theology. Do theologians pay a price for endorsing such a 'scientific theology'?

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[3] For a helpful overview of van Huyssteen's theological thinking, see Reynhout, 2006.

[4] Rather than the wider German understanding of science as *wissenschaftlich*, the adjective 'scientific' here relates to the methods and objectives of the natural sciences. Such a 'scientific' theology ascribes to and applies the methods of science in their theological reflection.

In this chapter, I set out to argue that such a scientisation of theology indeed leads to a rather problematic view of theology for at least three reasons. First, the critical realists' account of theology is grounded on a faulty analogy between both disciplines, where pivotal differences between science and theology seem to be overlooked. Second, central to the scientisation project of critical realists is the distinction between bottom-up and top-down theology, where critical realists favour a bottom-up approach because it is considered to be more in line with the approaches used in science. However, as I will point out, such a characterisation of the theological method has a number of significant shortcomings. First and foremost, the strong emphasis on the bottom-up approach amongst critical realists leads to the rather unfavourable outcome of theological anthropomorphism, because central to this approach is our human speaking about God, which proceeds from experience to understanding. As Polkinghorne puts it, theology "seeks to proceed from the basement of evidence and experience to the higher level of theological understanding" (Polkinghorne, 2000: 203). However, such an approach might actually lead to theological anthropomorphism, where God is defined in and restricted to our terms and conditions; an accusation that critical realists want to avoid. Second, however, the bottom-up/top-down distinction does not seem to be very helpful for understanding the richness of theological practice. For example, such a distinction assumes a rather narrow focus of theology, either limiting theology to academia or the church. Hence, whilst a scientific theology might look promising to those who want to 'revive' theology in a scientific era, I will set out to argue that there are significant shortcomings to this approach. But before we could develop these arguments in more detail, we first need to explore the views of critical realism regarding theology, which we will do in Sections 7.2 and 7.3.

7.2 From Philosophy of Science to Theology

Because of fierce existential challenges to theology in the current scientific era, critical realists set out to rethink the essence of theology in the light of the then recent developments in philosophy of science. As Barbour puts it, "recent work in the philosophy of science has important implications for the philosophy of religion and for theology" (Barbour, 1974: 3). In warding off these existential challenges, critical realism aims to demonstrate the 'striking' similarities between scientific practice and theological discipline, in which theology undergoes what seems to be a scientific make-over. Rather than grounding theology's 'right to exist' in ecclesiastical authority

or provide historical reasons, theological method is linked with the vocabulary of the sciences, where dogmas and doctrines are viewed as models and theories. For critical realists, such a scientific theology provides a critical and rigorous accounting of the Christian faith. Like the sciences, theology is thus understood as a critical enterprise, where its beliefs, dogmas, and commitments are put under critical reflection and examination using universal criteria akin to the ones used in science. Due to the seemingly one-sided influence from philosophy of science to theology,[5] a helpful starting point in exploring the critical realists' theology is to look at how the two major arguments used to humanise the sciences, i.e. the scientist as, on the one hand, experiencing and, on the other hand, historical being, seep through and underpin the critical realists' account of theology.

7.2.1 The Theologian as an Experiencing Being

In Chapter 5 'The Humanisation of Science: The Scientist as Experiencing Being', I have explored the notion of personal participation of the scientist in scientific practice. Central to this chapter was the critical realist's attempt to replace the popular view of science as a logical and mechanical practice with an alternative that is conscious about the subjective factors influencing scientists. A similar argument has been put forward in the context of theology, according to which the theologian is understood as actively contributing to the process of acquiring knowledge.[6]

Theologians, critical realists maintain, are participating and contributing to the, albeit inadequate, knowledge of God, because – as discussed in Chapter 2 'The Mind-Independence of What?' – all our knowledge claims are considered to be scheme-dependent, whilst God exists scheme-independently.[7] As a process of conceptual construction, or – as Wentzel van Huyssteen puts it – creative construction, critical realists recognise the creative contribution of the theologian to the construction of theological models and theories.[8] In its encounter with the divine reality, all experience is theory-laden and molded by the believer's prior interpretative framework. As Barbour puts it, "there is an interaction between experience and interpretation in religion which in some ways resembles that occurring in science; here, too, there is no

[5] Others have been rather critical about the transferring of philosophy of science to theology, which will be discussed in more detail down below.
[6] See Barbour, 1997: 151-154.
[7] See p. 66ff.
[8] See van Huyssteen, 1989: 144.

uninterpreted experience" (Barbour, 1966b: 208).[9] Theology is a tacit commitment to certain beliefs and hopes that shape these religious experiences. This pivotal role of interpretation and experience creates a two-way interaction, where the systematic study or interpretation of religious experience is affected by the religious experience itself and vice versa. Or, as Polkinghorne puts it, "experience and interpretation intertwine in an inescapable circularity" (Polkinghorne, 2009: 126). As a consequence of this two-way interaction, direct and immediate knowledge of the divine is impossible. All knowledge is prone to error and there is always the possibility of misinterpreting religious experiences, due to the mediated nature of our knowledge. Hence, there are no theory-free or theory-neutral religious observations or experiences.

7.2.2 The Theologian as a Communal Being

In addition to psychological factors influencing the scientist as an individual, a second set of arguments against the naïve realist account of science is concerned with the pivotal role of the scientific community. The leitmotif of Chapter 6 'The Humanisation of Science: The Scientist as Communal Being' were the various sociological factors affecting the scientists in their scientific practice. It has been in particular the work of Kuhn that has provided the means for critical realists to establish the idea of the scientist as communal being, shifting the locus of authority from a mechanical and logical process to the scientific community. Similar, then, to science, theological practice is fundamentally communal in its life and operations, due to the fact that no individual theologian is capable of overseeing all the complexities of human knowledge of the divine reality. As Peacocke puts it, "both kinds of model, scientific and religious, are formulated and propounded in the context of a community that is a living tradition of reference back to originating experiments and experiences, and one that has developed and is still developing language and symbols to maintain this continuity of intelligibility" (Peacocke, 1984: 42).

Theological inquiry occurs within its community, where social factors, such as shared attitudes, paradigms, linguistic constructs and commitments, influence the acquisition and understanding of religious knowledge. In becoming part of the theological community, theologians are submerged in the prevalent attitudes and commitments, which shape the 'lenses' of the theologians' worldviews. Pivotal to the

[9] See also Barbour, 1997: 110.

religious community is the role of shared experiences, which leads to a common memory. For Barbour, examples of such shared experiences in the past can be found in Scripture, such as the Mosaic covenant at Sinai and the crucifixion of Christ.[10] For critical realists, thus, theology is a collective enterprise with a corporate history, where collaboration is nurtured amongst its participants and collectively intend to grasp the divine reality.

Religious knowledge is thus, according to critical realists, both personal and collective knowledge. Barbour aptly brings these strands of the scientist of experiencing and communal being together in his assertion that "the experience of the individuals in community is the starting point of theological interpretation" (Barbour, 1966b: 210). Hence, for critical realists, it is the rooting of interpreted experience within the wider religious community that is considered to be a reliable guide to the objective divine reality.

7.3 The Scientisation Project of Theology: A Bottom-Up Stance

With the underlying contours now complete – the theologian is understood as an experiencing being that is embedded in a wider community of religious believers – we can now turn to the scientisation project of critical realism and the construction of theological theories. Critical realists' theology gravitates around the idea of theology as a critical reflection that is grounded on its evidential data, i.e. religious experiences and narratives. As van Huyssteen puts it,

> Theology is an attempt to reflect as authentically and creditably as possible on whatever we have, through our religious commitment, come to know and experience as God's revelation. Theology is therefore a form of reflection in which we use the formulation of models to transform our metaphoric religious language into lucid and explicit theoretic concepts, thus striving for a tentative articulation of our provisional but nonetheless certain knowledge of God (van Huyssteen, 1989: 144).

Hence, theology is understood in terms of a critical accounting of our religious experiences and narratives, and religious data are clustered into hypothetical theories

[10] See Barbour, 1966b: 215; idem, 1997: 114-115.

that allow theologians to formulate tentative statements about God; a language that is akin to the one used to describe the approaches and methods used in science.

In unpacking van Huyssteen's statement, attention should be given to an approach that is characteristic for the critical realists' theology: all theological thinking should start from below, which "places at the center past and present religious experience, the continuous community, and an interpretative tradition" (Peacocke, 1984: 47). Theological thinking should infer its doctrinal principles from the available religious data, rather than adjusting the materials to fit the abstracted categories and principles that have been put forward by those who have a certain authority over others; an approach characterised as 'top-down'.[11] Polkinghorne coins the term 'bottom-up' to characterise such a theology from below.[12] For Polkinghorne, it "is a natural stance for a scientist to adopt" (Polkinghorne, 1994: 4), and he considers the 'bottom-up' approach as an "appropriate apologetic strategy for Christian witness to the scientific community" (Polkinghorne, 2000: 204). Such a 'bottom-up' approach then proceeds from the sociologically and psychologically conditioned experiences to the higher level of formulating explanatory hypotheses and theories, and it takes religious data, such as experiences and narratives, as grounds for theological reflection. Rather than appealing to ecclesiastical authority (an approach sometimes taken by 'top-down' theologians), the 'bottom-up' approach proceeds from evidence to understanding, where theological debates and schisms are decided on the grounds of certain criteria of reasonableness.[13] It is, thus, not those in certain ecclesiastical positions who decide whether beliefs and doctrines are valid. On the contrary, with the criteria of

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[11] 'Top-down' theology uses general principles, such as theological traditions and doctrines, to interpret particular phenomena, and is characterised amongst critical realists as an ambitious intellectual endeavour that causes distrust amongst theologians. See Polkinghorne, 1994: 4; *idem*, 2006b: 93.

[12] Whilst Barbour and Peacocke do not use the same phrase as Polkinghorne to describe their theological approach, similar views and sentiments can be found in their endeavours as well. Both Barbour and Peacocke share a strong emphasis on the human side of and its contributions to the God-man relationship, and our theological reflection should start from our religious experiences. Peacocke, for example, claims that

> For any theology to be believable it will have to satisfy the criteria of reasonableness that lead us to infer the best explanation of the broader features of the natural world ('natural theology', traditionally), and of what men and women believe to be their experiences of 'God'. Truths that are claimed to be revealed or are the promulgations of ecclesiastical authority cannot avoid running the gauntlet of these criteria of reasonableness, for they cannot be at the same time both self-warranting and convincing (Peacocke, 1993: 18).

See Polkinghorne, 1996a: 24 for an approval of Peacocke's argument.

[13] The notion of 'criteria of reasonableness' will be discussed down below, but we also looked at these criteria in the context of epistemology. See Chapter 3 'Critical Realism and Epistemology', p. 86-89.

reasonableness in hand and through the process of critical and systematic reflection, the religious believer seems to be equipped to decide for himself; a process more akin to the sciences.

7.3.1 Theological Fallibilism, Theological Relativism and the Criteria of Reasonableness

Pivotal, then, for critical realists is the already discussed notion of fallibilism, which also applies to the theological method. As Polkinghorne, for example, puts it "theology, like science, is corrigible. There is nothing immutable in its pronouncements" (Polkinghorne, 1986: 34). As with all modes of acquiring knowledge, the theological grasp of the divine reality is prone to error and, hence, there are gradations in the truthlikeness of theological claims. As Peacocke puts it, a critical realist perspective in theology "would maintain that theological concepts and models should be regarded as partial and inadequate, but necessary and, indeed, the only ways of referring to the reality that is named as 'God' or to God's relation with humanity" (Peacocke, 1993: 14).[14] Critical realists, therefore, deny the possibility of acquiring infallible theological knowledge, where if *S* knows that *p*, then it is impossible for *S* to err in knowing that *p*.[15] In theological terms, such an infallible theology implies that, say, the Church is unable to be in error about the revealed truth. The Roman Catholic doctrine of '*ex cathedra*', i.e. 'from the throne', is a clear example of infallibilism in theology, where the official papal pronouncements are held to be infallible. Whereas such an infallible theology asserts that the Church speaking of God represents the divine adequately and exhaustively, all theological knowledge, critical

[14] Critical realists attempt here to solve an important theological conundrum between the positive and negative theology. For critical realists, theological constructs are both referring to God and recognising the limitations of our references; God-in-Himself remains at least in part hidden, yet God is not unknowable. As Peacocke puts it,

> It is here that negative and positive theology meet: the former recognizes that, having referred to God, whatever we say will be fallible and revisable and *ex hypothesi* inadequate; the latter that to say nothing is more misleading than to say something, and that then we have to speak metaphorically. So, we have grounds for affirming that metaphorical language, the language expounding the theological models that explicate religious experience, can be referential and can depict reality without at the same time being naively and unrevisably descriptive. And this character theological models share with scientific models of the natural world (Peacocke, 1984: 45-46).

[15] For a critical analysis of this argument in the context of theology, see Chapter 3 'Critical Realism and Epistemology', p. 89ff.

realists maintain, should be understood as liable to being mistaken, misrepresenting the divine.

Yet, there is a subtle difference with the notion of fallibilism in the sciences. Even though there are a range of competing scientific theories and models present to explain a certain phenomenon, there is – ideally – always one scientific hypothesis, or set of hypotheses, that offers the best explanation for this phenomenon. Contrary to the sciences, such a striving towards one particular explanation for the divine seems to be less prevalent in religious practice. The critical realists' emphasis on fallibilism and the resulting epistemic humility leads to an endorsing of epistemic diversity amongst religious believers, or what might even be called 'theological relativism'. For critical realists, there is neither a standard account of Christianity, nor has any ecclesiastical tradition epistemic primacy over other denominations. Theological controversies are considered to be "endemic in the life of the Church, so that any realistic account of the Christian phenomenon strongly suggests the inconceivability of there ever being complete agreement about the identity of Christianity" (Polkinghorne, 1994: 35). Religious diversity is, thus, not a 'cancelling cacophony', as Polkinghorne puts it;[16] on the contrary, theological fallibilism and the resulting theological differences and religious diversity are considered to be 'laboratories for theological experimentation' – to use a phrase coined by Murphy – that contribute to the ecumenical efforts within the various branches of Christianity.[17]

However, the assumed epistemic diversity amongst religious believers does not necessarily lead to theological relativism, critical realists maintain, where every belief or doctrine is considered equally valid. Whilst all theological assertions are by definition revisable and inadequate, according to critical realists, some beliefs and doctrines represent the scheme-independent divine more accurately than others. For critical realists, there seems to be an objective reality out there to which the theological constructs refer.[18] It is the existence of the mind-independent God and truth understood as a relationship of correspondence between our theological constructs and the divine reality that wards off theological relativism. All our knowledge claims may well be

[16] See Polkinghorne, 1994: 34.
[17] Murphy, 1990: 166. The phrase is used by Polkinghorne to characterise epistemic variety amongst theologians. See Polkinghorne, 1994: 35. For the ecumenical efforts resulting from the critical realists' stance, see e.g. van Huyssteen, 1989: 145.
[18] As will be discussed below, whilst critical realists endorse the mind-independent existence of the divine, there are seems to be an ambiguity here in the critical realists' reflection as there are clear anthropomorphic tendencies amongst critical realists.

fallible and scheme-independent, but, nevertheless, these claims should still correspond to a scheme-independent reality. This is where theology becomes relevant as a critical analysis and reflection upon our religious experience. With the conditioned nature of all knowledge claims in mind,[19] theology operates as a critical corporate enterprise that uses certain objective criteria to determine whether or not a particular theological construct corresponds to the mind-independent reality.

Furthermore, beliefs and the resulting theological theories and models are neither mere useful tools nor only concerned with a way of life.[20] On the contrary, critical realists consider these beliefs and other theological constructs, first and foremost, as having a cognitive function, where truth is a central concept and the meaning of religious beliefs are defined by their truth-conditions.[21] Rather than mere inspiration or nurturing certain behavioural attitudes, as suggested by certain theological anti-realists,[22] for the statement 'God is love' to be true, for example, implies for critical realists that there really exists such a loving God. As van Kooten Niekerk puts it, "the Christian way of life presupposes matters of fact, first and foremost the existence of God as a loving God" (van Kooten Niekerk, 1998: 71). Theological truth then, according to the critical realist stance, is considered to be a referential relationship between the divine reality, its furniture and our language, where statements, such as 'God is love', are true if and only if they correspond to a divine being who has the property of love. Against theological relativism, theological constructs do refer and aim to give a representation of the divine reality, albeit partial and inadequate one, where some beliefs represent the divine phenomena better than others.

How, then, are the theological constructs warranted and how is the correspondence between these constructs and reality determined? Whilst traditions such as the Quakers share a strong inward sense, where the reaching of theological consensus is considered to be a sign of the presence of the Holy Spirit in their midst, traditionally, doctrines and dogmas have been validated, critical realists maintain,[23] in a more authoritarian manner, with orthodoxy as its central determinant. Phrases such as 'the Bible says' or 'the Church says' have often been used to warrant a certain belief. However, for critical

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[19] See Chapter 2 'The Mind-Independence of What?', p.66ff.
[20] Against, for example, Braithwaite, who considers religious beliefs and stories as inspiring an agapeistic way of life, rather than having a cognitive function. See Braithwaite, 1971.
[21] This is what Barbour calls the 'cognitive function' of religious language. See Barbour, 1974: 5.
[22] See e.g. Braithwaite, 1971; Cupitt, 1984.
[23] See Peacocke, 1984: 38-40; *idem*, 1993: 18.

realists, such a 'top-down approach' that is grounded on authority leads to disagreements amongst the different denominations.[24] What is needed is an objective tool to determine the validity of theological doctrines and beliefs, comparable to the ones used in the sciences, in order to replace the traditional appeal to ecclesiastical authority. For critical realists, consensus should be reached in an intersubjective, rather than an authoritarian, manner, and they have suggested a number of criteria of reasonableness that might offer such an objective tool.[25] As already discussed in Chapter 3 'Critical Realism and Epistemology', such a set of criteria consists of four constituents (Barbour, 1997: 113):[26]

1) Religious beliefs should *agree with data*, according to which religious beliefs should correspond to and adequately render religious experiences and the stories told by the religious community;
2) Religious beliefs should *cohere* with other accepted and relevant beliefs that form the dominant paradigm of the religious community;
3) Religious beliefs should be consistent with and be extended to other kinds of human experience and knowledge, such as recent scientific findings. *Scope* is the term used for this criterion;
4) Religious beliefs should nurture ongoing development of religious beliefs and behavioural transformation, which is the criterion of *fertility*.[27]

These criteria of reasonableness, then, allow critical realists to allocate the decision whether or not a certain belief or doctrine is considered valid outside the reach of those who have the authority. With the criteria of reasonableness in hand, it is the religious community that is part of a particular paradigm that decides whether or not a theological assertion holds true.

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[24] See Peacocke, 1993: 18. Peacocke argues that there is even a crisis of authority, due to the fact that "it is now widely realized that no sacred writing and no sacred tradition can ever be self-authenticating in the sense of themselves validating their own claims to truth" (Peacocke, 1988: 47). Hence, the need for an objective framework to determine the validity of religious doctrines and dogmas.

[25] This notion of intersubjectivity has also been used in the critical realist's redefinition scientific objectivity. See e.g. Barbour, 1966b: 183.

[26] See p. 86-89.

[27] In his *Issues in Science and Religion*, Barbour only mentions three criteria of reasonableness. 'Fertility' is not mentioned as a criterion. See Barbour, 1966b: 253. For a different set of criteria, see van Huyssteen, 1989: 146, who distinguishes three criteria: theological statements should (1) depict reality, (2) have critical and problem-solving abilities, and (3) be constructive and progressive.

7.3.2 Theology and Its Data: Experiences and Stories

What, then, are the data of theology to which these criteria of reasonableness are applied? As far as I can see, critical realists have put forward at least two kinds of data.[28] The first set of data consists of the religious experiences of the individual within the wider community of religious believers.[29] It is in the encounter of the divine where religious experience emerges, and religious knowledge is constructed. God's reality is indirectly 'co-given' – to use a phrase of Wolfhart Pannenberg – in our religious experience.[30] As discussed above, such an experience of the divine is never theory-free or theory-neutral. All experiences are fundamentally interpreted within the prior conceptual framework of the experiencer. In theological practice, then, such religious experiences are being reflected upon and put into a wider religious and interpretative framework, which leads to a more established formalisation of religious experiences into narratives and rituals.

Second, critical realists consider the stories and rituals of the religious community as providing a second data set. Stories and rituals are part of the basic constituents of life and allows us to capture and narrate our relationship to both the physical and divine world. Furthermore, stories and rituals have a pivotal role in liturgical practices and rituals of the religious community, where the historical events are recalled and become present in certain acts, deeds, and words. In Christian tradition, stories, historic events, and rituals are collected and bound together in the Bible, which are considered to be normative for the tradition. This collection of authoritative writings gravitates, according to Barbour, around three central stories (Barbour, 1997: 114-115):

1) *Creation*, which tells us about the divine origins of the physical world;
2) *Covenant*, where the people of Israel are liberated from captivity and enter into an ongoing relationship with the liberating and redeeming God;
3) *Christ*, which narrates the life, teachings and resurrection of the Son of God.

Each of these central stories form a leitmotif of theological thinking.

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[28] See Peacocke, 1993: 16; 18, 94; Polkinghorne, 1994: 35; Barbour, 1997: 110; 113. For a more in-depth engagement of theological data, see Murphy, 1990: 130-173.

[29] Barbour distinguishes six different types of religious experience, ranging from experiencing the Holy to nurturing certain moral obligations. See Barbour, 1997: 111-112. In his *Myths, Models, and Paradigms,* Barbour distinguishes seven types of religious experience, adding the communal experience of certain historical events to the list. See Barbour, 1974: 53-55.

[30] See Pannenberg, 1976: 301.

How, then, are stories and rituals categorised as data for theologians? In addition to its spiritual and contextual role, critical realists also ascribe an evidential role to the Bible.[31] Expressed in various linguistic styles, ranging from poetry, parables to prose, Scripture serves as a historical record of both individual and communal religious experiences. It provides access to the historical events and their theological significance, such as the life and death of Christ. In this evidential role, Scripture, for critical realists, is put on an equal epistemic footing with the sciences, where practices of, say, New Testament scholars are comparable to those in the physical sciences. As Polkinghorne vividly puts it, "just as a palaeontologist gains insight from a specific part of the fossil record, or an astronomer finds that the unusual event of the regularly flashing pulsar affords confirmation of his ideas about neutron stars, so in the phenomena of the New Testament the Christian finds those particular sources of enlightenment on which he grounds his understanding of God and of the world" (Polkinghorne, 1986: 38).[32] Hence, for critical realists, religious experiences and narratives underpin the conceptualisation of theological models and theories. Resulting from both data sets are religious beliefs about the divine reality, which are put under critical reflection and examination using the aforementioned criteria of reasonableness.

Hence, for critical realists, theology is a critical accounting of the Christian faith, where systematic and logical procedures and mechanisms are used to explore and understand the divine reality. Rather than pronouncing theological statements on grounds of ecclesiastical authority and tradition, critical realists turn to approaches used in science and transfer these – as it were – to theological practices. In doing so, theology undergoes a scientific makeover, where the traditional vocabulary of dogmas

[31] See Polkinghorne, 2004: 38-44. Whilst critical realists refer to the Bible as a source for data, a comprehensive engagement with Scripture seems to be lacking in their literature and remains rather superficial. Critical realists seem to be more interested in a philosophical analysis of the science-theology exchange, instead of carefully bringing together Scripture and the results of science. This seems to be a wider tendency amongst the participants in the field of science and theology. Mark Harris, for example, provides an apt diagnosis, according which "such has been the ferocity of the debate, especially in North America, that the science-religion dialogue has tended largely to avoid the key scriptural areas of contention, and to engage with creation at a more philosophical level instead, where, it is believed by many mainstream scholars, the real issues of interest lie in any case" (Harris, 2013: 2). For a comprehensive overview of Scripture and the sciences, see e.g. Harris, 2013.

[32] Van Huyssteen takes a similar stance as Polkinghorne in characterising theologians as scientists, claiming that "the role of theologians committed to reality is to serve the context of the church while nonetheless maintaining their independence as scientists through critical, constructive involvement in the academic context" (van Huyssteen, 1989: 169).

and doctrines and standard procedures are replaced with a language and approach more akin to the sciences. Such a scientific theology, critical realists maintain, should be taken seriously and counters the existential challenges theology often faces today. But what are the origins of such a scientific method to theology? In the following section, we will critically explore this particular issue in more detail.

7.4 Bottom-Up Theology: A Critical Analysis

As mentioned in the introductory remarks, critical realists intend to justify the relevance of theology within academia by reshaping theological practice according to the terms and conditions of the (natural) sciences. For critical realists, developments in philosophy of science have been particularly helpful in guiding their explorations of such a reshaped theology. As Barbour puts it, "it has been largely through the work of philosophers that thought about the methods of science has affected religious thought in recent decades"; what is more, "writings in philosophy of science have had major repercussions in the philosophy of religion" (Barbour, 1974: 3).[33] A similar sentiment can also be found in van Huyssteen, who claims that "I am convinced that scientific realism, in the form of a qualified critical realism, has tremendous resources for supporting the reliability and validity of theological assertions" (van Huyssteen, 1989: 155). Rather than using a framework and vocabulary that is developed within theological practice, critical realists turn to external aids, where church traditions are turned into Kuhnian paradigms and theological schism are characterised as paradigm shifts.[34] Lakatosian research programmes have also aided the critical realists endeavour of establishing a scientific theology.[35] Theology as such should be divided into research programmes, each with a hard core and so-called protective belt. Such a scientific theology, with its roots in recent developments of philosophy of science, is

[33] Such an approach to theology, where philosophy of science has a kind of a mirror function that helps theologians to understand how to reflect on and discuss theological matters, is not only limited to the critical realists. It has been Kuhn in particular who has received warm receptions amongst systematic theologians. Hans Küng, for example, admits, on a more biographical note, that it was this Kuhnian notion of paradigm change "that enabled me to understand more deeply and comprehensively the problems of growth in knowledge, of development, of progress, of the emergence of a new approach and thus, in particular, the present controversies, also with reference to theology" (Küng and Tracy, 1989: 7). More recently, Dirk-Martin Grube applied the Kuhnian notion of paradigms to help understand the emergence of Christianity, with a particular focus on Christological issues. See Küng and Tracy, 1989; Grube, 2012.

[34] See van Huyssteen, 178.

[35] See Barbour, 1997: 132-135.

able to ward off challenges to the relevance of theology within academia, giving theology a less isolated place in which it often finds itself.

7.4.1 Critical about the Approaches used to Establish a Bottom-Up Theology

Whilst critical realists aim to establish a mutual relationship between science and theology, with the relationship defined on grounds of equality, a shift seems to take place in establishing their scientific theology. Their constructive application of critical realism to theology often tends to be one-directional from science to theology, where philosophy of science provides the ingredients, such as a vocabulary and a rationale, for understanding the theological discipline. Rather than looking at sources and approaches distinctive to its own practices, theology should listen to and learn from the sciences in order to validate its own existence and, thus, remain rather passive in the process of scientisation. Underpinning this seemingly one-sided perspective from (philosophy of) science to theology is the belief that, on a structural or methodological level, science and theology are fundamentally similar, sharing many features that are highlighted to demonstrate theology's relevance in an era dominated by the sciences. Differences between both disciplines are disparaged as differences in degree, rather than kind.

Yet, is such a submission of theology to the standards of science even possible? For critical realism, submitting theology to similar criteria used in science is indeed possible – even necessary, given the current isolated place of theology within academia – if theology is defined as the critical and empirical examination of religious experiences and narratives. Such an empirically-based theology, then, should replace the more traditional approaches to theology because these approaches cannot uphold the standards of sciences. All theology should start with the available (empirical) data – an approach similar to the sciences. Underpinning their approach to theology is an inclination towards methodological scientism, according to which the methods and practice of the sciences are extended "to other academic disciplines in such a way that they exclude (or marginalize) previously used methods considered central to these disciplines" (Stenmark, 2001: 3). An example of such a methodological scientism in the realm of theology is the replacement of more traditional approaches, such as historical, systematic, and hermeneutical, with the critical realists' 'bottom-up' approach, where the validity of theological constructs is determined using the criteria of reasonableness.

This prioritisation of science over theology reveals a contradictory mechanism underpinning the critical realists' endeavour. From the outset, critical realists have been critical about the epistemological capabilities of the sciences, where scientific objectivism is rejected as misrepresenting the *actual* practice of the sciences. Rather than a logical and mechanical procedure, critical realists point out the psychological and sociological factors influencing scientists as well as the scientific community. However, in order to reinstate theology, critical realists turn to the methodological considerations in philosophy of science to give theology a 'scientific makeover', where previously used approaches are replaced with methods more akin to the sciences. For critical realists, science, then, still seems to have priority over theology, as science seems to be considered the hallmark of establishing true knowledge, and methodological considerations in theology are still validated and shaped in accord with approaches used in philosophy of science. As a result, what critical realists have in mind as science clearly affects how they think about theology.

However, even amongst critical realists, such a one-directional transfer of the grammar of science to the language of theology has been criticised.[36] According to van Kooten Niekerk, there are at least three significant differences between science and theology, which makes such a direct transfer of critical realism to be problematic.[37] First, the existence of the theological subject matter, i.e. God, is embedded in severe doubt for many, whereas the natural world has been generally accepted to exist. For van Kooten Niekerk, this problematic nature of the theological subject is "due to the fact that God does not make his reality irresistibly felt in sense experience as the natural world does" (van Kooten Niekerk, 1998: 73). Experiencing God's existence is limited to the realm of the personal. Second, whilst observation, experimentation and repeatability are part of the core of the scientific discipline, such practices are absent in theology. God cannot be experimented upon and his actions cannot be put under critical examination in a similar manner as, say, scientists studying protons and neutrons.[38] Due to this inability to observe, experiment, and repeat within theology,

[36] See Gilkey, 1993: 41; van Kooten Niekerk, 1998: 73. For a non-critical realist critique of transferring philosophy of science to theology, see McMullin, 1985; Drees, 1996: 139-144.
[37] See van Kooten Niekerk, 1998: 73-78.
[38] Polkinghorne recognises this as well. As Polkinghorne puts it, "admittedly theology does not offer predictions open to straightforward empirical testing such as psychical science habitually does, at least at its lower levels" (Polkinghorne, 1991: 15). For Polkinghorne, then, it is not so much God but rather our religious experiences that makes theology an empirical discipline, and, as discussed above, theology should be concerned, or even build upon, these experiences. However, Polkinghorne does not delve into how such experiences could be tested on scientific principles. Furthermore, if all knowledge of God is

theological statements have, van Kooten Niekerk maintains, a higher level of uncertainty.[39] Third, despite aforementioned similarities, there are fundamental differences in the way scientists and theologians employ models and metaphors. In addition to differences in the degree metaphors are used, dissimilarities emerge between science and theology as the metaphors used in the sciences are concerned with phenomena within the physical world, whilst theology directs its metaphors toward a transcendent being. As a consequence, there is a higher level of dissimilarity between the theological linguistic constructs and their objects compared to the ones in the sciences. Hence, direct transferring of philosophy of science by way of analogy to theological practice seems to be infeasible, van Kooten Niekerk maintains.

7.4.2 The Downside of Empirical-Based Theology: Evoking Theological Anthropomorphism

Furthermore, there is at least one other significant risk attached to such an empirical approach to theology: the methodological considerations underpinning the critical realists' theology may well lead to theological anthropomorphism, where God is reduced to our terms and conditions. How does this criticism work? With their strong emphasis on religious narratives and experiences as data for our theological reflection, there seems to be no or at least less room for God's revelation. Rather than God's gracious self-disclosure, all sources which theologians should use and apply the criteria of reasonableness to are human in nature, i.e. stemming from our experiences and narratives. Theology, according to critical realists, is a process of sifting through the various religious human experiences, and, thus, we limit our descriptions of God to the human material that is available to us. As such, one could argue that the danger of such an empirical approach is that our knowledge of God is ultimately reduced to a mere anthropomorphic projection; an image of ourselves projected upon the screen of objectivity that we call 'God'. Moore puts it aptly in the context of Soskice's theology, where he states that "her argument appears to be anthropocentric and empirical rather than kyriocentric and theological: she focusses on believers and their experiences rather than on God in his self-revelation through the work of Jesus Christ" (Moore, 2003: 50). A similar sentiment can be found in the literature of Barbour, Peacocke,

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reduced to our religious experiences and these experiences originate in God, then – at least it seems to me – we are putting God under critical examination, or put to test, by studying the religious experiences.

[39] See van Kooten Niekerk, 1998: 74.

and Polkinghorne.[40] As the divine being is reduced to our sociologically and psychologically conditioned experiences, theology becomes mere anthropology.

The issue, then, at hand here for critical realists is how to ward off the accusation that "the object of any subject is nothing else than the subject's own nature taken objectively" (Feuerbach, 1957: 12). Barbour has explicitly rejected the idea of God as a mere anthropomorphic projection. For Barbour, it is the appeal to the theological realist stance, according to which God exists mind-independently, that allows him to ward off the Feuerbachian charge.[41] However, it is indeed the case, according to critical realists, that God exists scheme-independently, but all our knowledge claims about God are considered to be scheme-dependent and, thus, to a certain degree projections and constructions of this transcendental being. This state of affairs and their endorsement of the 'bottom-up' approach in theology, then, seems to bring the criticism of anthropomorphic projection back on the table. All we can know about the divine are our projections and constructions, which have their rooting in religious experiences and narratives, rather than, say, divine revelation. Situated within our more human framework of reference, these religious experiences and narratives then analogously represent the divine. Knowledge of God does not stem from God, but we only know God using material that is available to us. Therefore, critical realists seem to be trapped in a vicious circle: rejecting anthropomorphism on the one hand, and, in their endeavour to establish similarities between scientific practice and theological reflection, using the argument for epistemological limitations and their strong emphasis on a theology 'from below', evoking a seemingly anthropomorphic take on theology on the other.

Another strategy that critical realists seem to take is to use the notion of 'unobservability' in philosophy of science analogically to possibly ward off theological anthropomorphism. The argument here gravitates around the idea that observable phenomena, such as religious experiences and narratives, are caused by God, who is unobservable. Barbour, amongst others, states that "as models of an unobservable gas molecule are later used to interpret other patterns of observation in

[40] See e.g. Polkinghorne, 1986: 46, where he rather explicitly states that "there is an inescapably anthropomorphic element in our talk about God, not because we believe that he is an old man with a beard living above the sky, but because our experience of human personality touches the deepest level of our being and so provides the least inadequate language to express our relationship with him who transcends personality" (Polkinghorne, 1986: 46).

[41] See Barbour, 1966: 256-257.

the laboratory, so models of an unobservable God are used to interpret new patterns of experience in human life" (Barbour, 1974: 49). We can find a similar sentiment in van Huyssteen, who claims that

> All our theological models are theoretic constructs. And although the object of systematic theology (for example, God, Jesus Christ, the Trinity, Atonement, or Predestination) is in principle inaccessible to observation (as are related areas in, for example, microbiology, chemistry, geology, and nuclear physics), our theories have enabled us – thanks to the metaphoric roots preserved in our religious language through the formulation of models and concepts – to define in our statements certain provisional conceptual boundaries for the object of our discussion (van Huyssteen, 1989: 163).

The approach here seems to be as follows: point out that the notion of unobservability can also be found in the sciences, and, as such, this notion could analogically be applied to shed light on our understanding of the relationship between the unobservable God and observable phenomena. Therefore, in order to distance themselves from mere anthropomorphism, critical realists endorse the assertion that "an unobservable entity (God) is causally responsible for observable phenomena (religious experiences)", and the notion of 'unobservability' in the sciences is used to sustain their arguments (Moore, 2003: 63).

Whilst claiming that observable religious experiences are caused by an unobservable entity is not so much a novel theological thought, there are good reasons for being critical about the role science has to play in this argument. The problem with theology's borrowing of 'unobservability' in philosophy of science is the fundamental disanalogy between science and theology that critical realists seem to overlook. Moore's criticism here gravitates around the question of whether or not unobservable objects in science are unobservable *in principle*, as van Huyssteen seems to assume in the previous quotation. For scientific realism, Moore maintains, there is *no* ontological dichotomy between observable and unobservable objects; a stance often assumed by anti-realists and considered by scientific realists as rather vague.[42] Referring to an

[42] See e.g. Ladyman, 2002: 186.

influential article of Grover Maxwell,[43] the observable and unobservable are continuous with one another, Moore points out, and there is nothing that prevents unobservable entities from existing.[44] We, thus, cannot draw an ontological line between observable objects and unobservable ones. However, the notion of unobservability is understood differently in the context of theology, because there is indeed an ontological line between creation and its Creator. God is considered to be unobservable *in principle*. There is no epistemic access that allows us to observe God, except when God decides to reveal himself to us. This sentiment has been captured very well by Karl Barth, who puts it as follows: "But this means that he is to be seen only as the invisible and expressed only as the inexpressible, not as the substance of the goal or origin of our seeing and speaking, but because he himself has given us permission and command to seek and speak, and therefore by his Word, in his free and gracious decision, has given us the capacity to see and speak" (Barth, 1957: 190). There is, thus, a fundamental distinction between the unobservable God and the observable objects; a distinction that is absent in philosophy of science.

But where does this leave us? According to Moore, it brings critical realism into a checkmate, if critical realists want to maintain the analogy: either distance themselves from scientific realism and uphold the notion that unobservable objects are unobservable in principle, or acknowledge the scientific realist stance and uphold their analogy, and, as a result, make God in principle observable.[45] As Moore puts it, critical realists

> can either be fully committed to a scientific outlook, make appropriate changes to their methodology, use the resources of the philosophy of science in the way they do, face the possibility that the balance of the argument concerning the entity they postulate to explain religious experiences will come up favouring naturalist non-cognitivism and, then, if it does, drop the realist claim. Or they

[43] See Maxwell, 1962. See also e.g. van Fraassen, 1980: 13-19 for a criticism of Maxwell's argument against the observable-unobservable distinction.
[44] Van Fraassen, for example, defines observability along the lines of being able to observe with the unaided eye. Since astronauts are able to travel to Jupiter, its moons are considered to be a case of an observable, whereas the micro-particles in a cloud chamber are not. For van Fraassen, then, the truth of a theory should be defined in terms of its empirical adequacy to 'save the phenomena', i.e. correctly describing what is observable-to-us. However, van Fraassen does not claim that unobservable are by definition non-existing, but, rather, that we should be agnostic about the claims regarding unobservables. See van Fraassen, 1980.
[45] See Moore, 2003: 65.

> can drop the proposed analogy, acknowledge that God is not unobservable in the way that the philosophy of science understands such entities, seek an amicable divorce from scientific realism, and find a more theological way of defending the realism of Christian faith (Moore, 2003: 71).

With Moore's critical assessment in hand, we have come to conclude that the borrowing of philosophy of science to reconfirm the academic credentials of theology is at the least problematic, but could also be quite harmful for theology as such. A very significant threat is theological anthropomorphism, and, due to their strong emphasis on bottom-up theology, critical realism seems to expose their theology to such a danger.

7.4.3 Finding a Solution

What, then, could be an alternative for critical realists to ward off anthropomorphic theology? Rather than merely grounding all theological reflection in religious experiences and narratives, critical realists could take a more positive stance towards a theology 'from above' and finding out ways to implement some of the 'from above' arguments in their theology. Eminent theologians that argue for such a theology 'from above', such as Karl Barth, who strongly reject such a theology 'from below', and who spend a significant amount of effort challenging Feuerbach's approach, might be a helpful resource for critical realists.[46] For Barth, theology should not start from the human standpoint, but must begin with critically reflecting from God towards the world; an approach characterised by critical realists as 'top-down'.[47] Contrary to the critical realist's human-centred theology, theological reflection regarding the divine being does not begin with religious experiences, as it has its origins in the self-revelation of God in Christ. All knowledge of God is considered to be an act of grace through Christ; a gift of self-revelation from God to humanity, as there is no way from humanity to God – a position that opposes the critical realists' bottom-up stance.

Such a theology 'from above' has its theological rooting in divine revelation, and as such there is an internal theological warrant for theology. With the divine revelation

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[46] As Weber puts it, Barth's "concern with the Feuerbach question extends from the earliest of his theological writings up through to the last published half-volume of the *Church Dogmatics*" (Weber, 1966: 26).

[47] For Barth, see Hunsinger, 1991: 76-102; Schwöbel, 2000: 17-36; van der Kooi, 2005: 251-316.

as its subject matter, theology is the only discipline within academia that is able to explore and clarify the divine reality. As Daniel Migliore aptly points out, Barth's "overriding emphasis, however, is that the questions of theology, no less than its answers, must be disciplined by theology's own subject matter and norm" (Migliore, 2004: 17).[48] Rather than the critical realist's endeavour of finding similarities between science and theology, a theology 'from above' does not need an external aid to validate its practices and results, where the (natural) sciences still have a methodological primacy over theology.[49]

Should we, then, only subscribe to a theology 'from above' in order to ward off theological anthropomorphism? Whilst such a theology might well be effective in warding off – among other things – anthropomorphism, a theology 'from above' has its own shortcomings as well, as critical realists point out. Critical realists seem to have a fair and valid point that enforcing the internal theological warrants, such as its subject matter, could lead to the rather isolated place theology currently finds itself in, where theology remains at large irrelevant to the wider academia. Rather than a conversation, those who endorse a theology 'from above' may well be characterised as taking part in a soliloquy, where theological constructs are reflected upon regardless of any (academic) hearers because such a theology one-directionally moves from revelation to culture. As Tillich puts it, "afraid of missing the eternal truth, they identify it with some previous theological work, with traditional concepts and solutions, and try to impose these on a new, different situation"; what is more, "the theological truth of yesterday is defended as an unchangeable message against the theological truth of today and tomorrow" (Tillich, 1951: 3). However, in the current era, contemporary developments in the sciences challenge the theological discipline on an existential level and, in warding off these challenges, theology should engage with the sciences. A theology that is entirely disengaged with the sciences seems to be an untenable position to hold nowadays, in particular if theology still wants to play a role within the wider society.

Furthermore, there are also internal reasons within theology for engaging with the (natural) sciences. In confessing God as Creator of the natural world, theologians are

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[48] For a more recent account of such a position, see Webster, 2005.

[49] A similar sentiment can be found in Gilkey's analysis of theology. In developing his views on critical realism in theology, Gilkey asserts that theology should be judged on its own terms, rather than submitting theology to the epistemological and methodological rigorousness of the sciences. See Gilkey, 1993: 41.

inevitably engaging with the same world to which the sciences refer, bringing science into the realm of theological reflection. As Pannenberg aptly puts it, "theologians must be concerned with the question of how theological assertions about the world, and about human beings as God's creation, can be related to their descriptions by scientists" (Pannenberg, 2006: 359). Theologians should, therefore, take notice of the results of the sciences as a means to understand creation, and, neglecting the sciences in discussing creation could lead to a distorted account of nature. A theology 'from above', then, might lend itself more easily for grounding their views on creation only on divine revelation,[50] and, as a result, consider the sciences as irrelevant for theological reflection. Hence, in addition to the above assertion that a theology that bears a closer resemblance to and engages in a conversation with the sciences might help to re-confirm the relevancy theology has for the wider society, and academia in particular, there are also internal reasons for engaging with (natural) sciences, where science could potentially become an important resource for theological reflection.

7.4.4 Two Preliminary Steps to Move Forward

If the critical realists' theology may well end up endorsing theological anthropomorphism and a theology 'from above' enforces the isolated place theology often finds itself, how, then, should we proceed? There are at least two preliminary steps that might offer ways to move forward. First, we should recognise the rather narrow focus critical realists seem to have with regard to their theology, where academia is considered to be the dominant context for understanding the theological discipline. For critical realists, the theological reflection seems to take place only within academia and theology should meet the standards set by other academic disciplines. As a result, theology undergoes a – as it were – 'scientific makeover'; and approaches traditionally used in theology are replaced with methods more akin to the (natural) sciences.

However, this seems to be a rather narrow focus of theology, because critical realists seem to ignore to the fact that theology also takes place in other 'social

[50] It is not the argument here that a theology 'from above' inevitably ignores the natural sciences in reflecting on God as Creator, but, rather, that their strong emphasis on God's revelation in Christ might lead to a belittlement of creation and, as a result, favouring a stance that considers the sciences as less relevant for their theology or being indifferent towards the sciences. Since a theology 'from below' has its rooting in *inter alia* human experiences, science has to be part of their theological reflection, because all theological speaking starts with experiences in the natural world and science could be a significant factor in explaining the religious experiences.

locations' – to use David Tracy's phrase.[51] Rather than a narrow focus on academia, theology is a much more pluralistic discipline, with branches in church and society that co-exist alongside academia.[52] Each of these have their own aims, engages with their own set of relevant questions, put their own emphases on certain challenges, have their own internal discourse, and use their own set of criteria to determine the validity of theological statements. Whilst the 'theology within academia' is concerned with its place as an academic discipline, a 'theology within the church' is much more concerned with the clarification and interpretation of the Christian message to its believers and the theologians becomes a 'believer' alongside other believers, rather than an 'intellectual' within the academic discourse. As a result, the methods, challenges, aims, and discourse adapt to the new context in which theology finds itself. The same holds true for the 'theology within society', where the theologian becomes a 'citizen' amongst other citizens and is predominantly concerned with the realisation of God's new justice and peace. Rather than a narrow focus on one of the 'publics' of theology, the theologian is, then, responsible for all three, providing a much more diverse view of the theological discipline.[53]

With their strong emphasis on a scientific theology, such a more pluralistic understanding of theology is currently lacking in the critical realists' accounting of the theological discipline. A theology that has been developed for the church might not need the rigorous methods akin to the sciences that critical realists suggest; it might actually jeopardise the theologian's service to the church, as the theologian might find himself more alienated from such an academic approach to theology. Rather than a strong academic practice, theology in such a context becomes a more theologically oriented discipline, whereas, in the context of society, its social institutions might be emphasised. Yet, in the critical realists' narrative, such a more diverse understanding is absent and, according to their stance, theology should conform to and be developed in accord with the standards of academia; a position that undermines the rich diversity underpinning theology.

Second, due to the pluralistic 'social locations' in which theology emerges, it might well be the case that a theology 'from below' might be more suitable as a strategy for the 'theology within academia', whereas a theology 'from above' may well be more

[51] See e.g. Tracy, 1981: 5.
[52] See Tracy, 1981: 6-28.
[53] See Tracy, 1981: 29.

relevant for, say, the church. Hence, the bottom-up/top-down dichotomy, or the theology 'from below' and theology 'from above' distinction, seems to be too strong, and, as a result, rather unhelpful for understanding the complexities of the theological discipline. Whereas a top-down approach tends to be rather ignorant towards the current situation and may well enforce the rather isolated place of theology within academia, the bottom-up approach seems to lose itself in the relativities of the academic context; what is more, it actually becomes a mere academic discipline, losing its ability to address the issues of the church and the wider society.[54]

A *via media* between the two extremes thus seems to be required that is able to manage the complexities involved.[55] Whereas the bottom-up/top-down dichotomy leads to a confusion or a neglecting of the revealed truth with more temporal religious expressions stemming from this revealed truth and vice versa, a conversation seems to be required that balances, rather than driving a wedge, between the contemporary expressions and the eternal truth. A promising direction to move forward here can be found in the work of Tillich,[56] who – as Russell Re Manning aptly puts it – argues that "theology is to be done, as it were, from the inside looking out: within the theological circle and in the midst of the cultural situation" (Manning, 2009: xvii). Such a theology is aware of the temporal expressions as well as its embedding in the eternal and historical truth of the Christian message, and it finds ways to mediate the apparent tension between temporality and eternality.

For Tillich, there is a correlation between culture and theology, similar to the correlation between question and answer.[57] Questions emerge in contemporary expressions of culture, both religious and non-religious, and it is the theologian that engages with and answers these questions on the basis of historical sources. As a result, such a theology "moves back and forth between two poles, the eternal truth of its foundation and the temporal situation in which the eternal truth must be received" (Tillich, 1951: 3). Doing theology, for Tillich, means being situated in a particular time, which causes the tension between the two poles of temporality and eternality,

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[54] See Tillich, 1951: 5.
[55] It is not my intention to offer a well-crafted stance here, but I rather set out to point into a – it seems to me – promising direction for future discussions.
[56] I do not intend to comprehensively discuss and criticise Tillich's systematic theology, but rather point out the attitude Tillich has with regards to balancing the temporary expressions and the eternal truth as an alternative for the bottom-up/top-down dichotomy. For a helpful overview of Tillich's work, see Russell Manning, 2009. For a discussion on Tillich's theology in relation to the sciences, see Haught, 2009.
[57] See e.g. Tillich, 1951: 66.

and theology should be an *answering theology*, which "answers the questions implied in the 'situation' in the power of the eternal message and with the means provided by the situation whose questions it answers" (Tillich, 1951: 6). Rather than putting apologetics to the side, all of theology should, thus, be apologetic theology, answering to the current context, whilst being embedded in the rich and eternal truth.

In recognising the various 'social locations' in which theological reflection takes place and suggesting an alternative stance that does not drive a wedge between the temporal situation and the eternal truth or the bottom-up/top-down dichotomy, I have set out to offer a number of preliminary thoughts to, on the one hand, ward off theological anthropomorphism and, on the other hand, offer an encouragement for theology against isolationism. It might be the case that theology is struggling with its credibility within the academic world, but theological reflection takes place in various contexts, and, in each 'location', theology is challenged in different ways and it uses different strategies and criteria to answer to these challenges. Whilst a more scientific approach to the theological discipline might offer an *apologia* for its existence amongst other academic disciplines, such an approach might be less fertile in the context of, say, the church or the wider society in general. Such a take on theology recognises the historical and cultural richness of the theological discipline, instead of narrowing down theology to its location within academia – a strategy that critical realists seem to take.

7.5 Concluding Remarks

Under the pressure of the unparalleled successes of science, theology is considered by many of the general public to be somewhat obscure, having no claim to real knowledge, and, hence, no right to exist within academia. Often, there are methodological concerns underpinning this existential challenge to theology, where science and its methods are considered to be the hallmark of truth. For a non-scientific discipline to ascend to the status of being scientific, it should ascribe to the same rules of logic and objectivity found in the sciences. Theology, however, fails to meet the standards of logic and objectivity set by these (natural) sciences. Critical realists, however, are rather sceptical towards this attitude regarding the theological discipline, and they have used two strategies to demonstrate the relevancy of theology to academia and the wider society.

First, as discussed in Chapters 5 and 6, critical realists emphasise the limitations of the sciences. Rather than endorsing the objectivist's account of science, where science is presented as an objective and mechanical-like approach for understanding the physical world, critical realists suggest an alternative account, which allows for the personal involvement of the scientist and recognises the pivotal role the scientific community has on its members. Scientists passionately participate in their quest for understanding reality, instead of being mere calculating and logical beings. Coupled with their endorsement of fallibilism, critical realists replace the oft-held belief that science has epistemological primacy over other modes of knowledge, and, as a result, make – as it were – 'epistemological' room for theology to co-exist with the (natural) sciences.

Second, not only does science take a step towards theology in becoming a more subjective discipline, theology takes steps in the direction of the sciences as well in undergoing a 'scientific makeover'. Approaches and vocabularies that traditionally belonged to theological practice are replaced with methods and a language more akin to the (natural) science. Doctrines and beliefs become theories and hypotheses, ecclesiastical authority is replaced with criteria of reasonableness, and religious experiences and narratives are considered to be theology's data. Underpinning this makeover is the endorsement of methodological scientism, where empirically based theological constructs are considered 'objective' and theologians are able to make progress over time. Consequently, theology becomes a discipline akin to the sciences.

However, the critical realists' stance towards theology is problematic in several respects. First and foremost, such an empirical theology leads to theological anthropomorphism; an outcome that is unfavourable even amongst critical realists. Second, whilst being pivotal for the critical realists' attempt to establish a theology more akin to the sciences, the bottom-up/top-down dichotomy seems to be rather unhelpful. In addition to the criticisms of theological anthropomorphism, the dichotomy is too strong, and its focus is too narrow. The critical realists' strong emphasis on the bottom-up approach should, thus, be replaced with a more balanced theology, which acknowledges certain knowledge as a gracious gift through Christ, whilst maintaining the relevancy of human factors, such as religious experiences, human expressions and our narratives, for the theological reflection.

In this chapter, we have particularly focussed on the critical issues that critical realism seems to face in the context of theology, but there are also some significant weaknesses on a more meta-level to which we should turn now in the next chapter.

CHAPTER 8

CRITICAL REALISM SCRUTINISED

An Evaluation

With the previous chapters now complete, we have addressed each key principle of our taxonomy of critical realism: metaphysical (Chapter 2), epistemological (Chapter 3), semantics (Chapter 4), and methodological commitments (Chapters 5, 6, and 7). We have also raised various chapter-specific criticisms against the commitments of critical realism. In the previous chapter, for example, we have pointed out the limitations in the direct transferring of philosophy of science to theology. We have now arrived at a position to zoom out a bit more and to evaluate Hefner's critical diagnosis with which I opened this research, namely:

> This now widely used term, 'critical realism', is beginning to appear in the writings of several authors in a somewhat doctrinaire sense, as if it were an established theory of explanation, when in fact it is a suggestive hypothesis that is struggling for credibility in the marketplace of ideas (Hefner, 1985: 32).

We will use Hefner's analysis as a way to structure this chapter by first looking into the suggestive nature of critical realism (Section 8.1). After this, we will suggest two general arguments that – I believe – will show that critical realism is indeed struggling for credibility, in addition to the arguments given in the previous chapters (Section 8.2). Finally, then, some concluding reflections will be offered (Section 8.3).

8.1 Critical Realism: a Suggestive Position?

Before we delve into our evaluation of the credibility of critical realism, we first need to shed some light on the suggestive nature of critical realism by studying its underlying aims. In the previous chapters, we have seen that critical realists make two particular moves that allow them to position science and theology in terms of a close kinship. First, as explored in Chapters 5 and 6, critical realists turn to those philosophers who argue for the more human side of science. Rather than understanding science in terms of strong and objective procedures which lead to conclusive and

definitive knowledge, critical realism sets out to provide an alternative narrative that recognises the personal involvement of the scientist in scientific research and the very significant role of the scientific community. The second move takes the opposite direction: rather than pointing out the more human factors, theology is presented as a more objective or even science-like discipline, as we explored in Chapter 7. But why do critical realists want to argue for a close kinship between science and theology?

A very helpful framework for answering this question has been suggested by Christopher Knight. In discussing the work of Polkinghorne, Knight points out similarities between Jaroslav Pelikan's characterisation of the three Cappadocian Fathers and Polkinghorne; a parallel that is also extended to Barbour and Peacocke.[1] In his 1992-1993 Gifford Lectures, Pelikan sets out to explore the Christian encounter and synthesis with Hellenism in the fourth century, with a particular interest in the works of the three Cappadocian Fathers. As a means to structure his research, Pelikan divides his Gifford Lectures into two halves: 'natural theology as apologetics' and 'natural theology as presupposition'. Whilst the former refers to the defence of Christian faith in the Hellenistic era, the latter relates to the endeavours of Gregory of Nazianzus, Basil of Caeserea, and Gregory of Nyssa to provide a 'superstructure' for Christian orthodoxy using the philosophical presuppositions of that particular period in time. A similar objective can be found in the endeavours of those endorsing critical realism, Knight suggests. As Knight puts it,

> The same interplay of apologetic and presupposition, it might be argued, has been characteristic of the development of Polkinghorne's work, for the scientific and philosophical understandings our own era has, in a way that exhibits significant parallels with the work of those Fathers of the Church, clearly both influenced him and been used by him in his defense and articulation of the Christian faith. The same might also be said of the other scientist-theologians (Knight, 2012: 629).

According to Knight, therefore, we could distil two intentions that underpin Polkinghorne's work: defending the Christian faith in an era that is dominated by the (natural) sciences and using recent developments in (philosophy of) science to

[1] See Knight, 2012: 629-630.

articulate a new narrative for theology. Let us unpack Knight's suggestion in the following sections.

8.1.1 Critical Realism as Apologetics

Throughout their oeuvre, critical realists are committed to demonstrating the relevancy of theology as an academic discipline, as explored in this study. But there is also a wider awareness in science-theology scholarship about the apologetic motives that seem to underpin critical realism. As Knight puts it aptly,

> One of the things that unites the work of all three of these scientist-theologians is a determination to show that our current scientific understanding – including aspects of it that some Christians have found problematic, such as evolutionary theory – is consonant with a commitment to religious faith in general and to the Christian faith in particular. In this sense, there is clearly an apologetic motivation to at least some of their work. Central to this apologetic, for all three, is a rejection of the sort of reductionism in which religious experience and faith are seen as being explicable in purely psychological or biological terms (Knight, 2012: 623).

Critical realists, according to Knight, are thus committed to demonstrate the consonance or 'cousinly relationship' between science and theology. But we find such a diagnosis of the apologetic nature of critical realism in other science-theology literature as well, such as in Gregersen's discussion of critical realism. For Gregersen, critical realism is a "suggestive position, which furthermore offers theology a sort of epistemic parity with science" (Gregersen, 2004: 77). Let us probe a bit deeper into the apparent apologetic motives of critical realism.

It has been in particular Fabio Gironi who pointed out in rather strong and polemical terms the apologetic motives that seem to underpin critical realism. According to Gironi, critical realists have 'hijacked' some core commitments of scientific realism and have used these as an apology for their Christian faith. As Gironi puts it, "the aim is to argue for their [i.e. science and theology] compatibility or parity, if not (more implicitly) for a downright primacy of theology when it comes to any human encounter with reality" (Gironi, 2012: 42). Or, in his concluding remarks, Gironi puts it as follows: "far from being the scene of a neutral (or explicitly hostile) confrontation or

comparison between science and religion, the disciplinary matrix in which the scientist-theologians operate has the covert apologetic purpose of representing theology as a peer of, and indeed as a monarch over, the natural sciences" (Gironi, 2012: 65). According to Gironi, the argument of critical realists for the methodological primacy of theology over and against science by 'hijacking' core beliefs of scientific realism shows the apologetic interests of critical realism. But what should we make of Gironi's rather strong words?

In responding to Gironi's article, Polkinghorne strongly rejects Gironi's accusations. As Polkinghorne puts it, "I deny that the invocation of critical realism is an attempt to gain illegitimate authority for theology and I reject the accusation of an intellectual hijack of scientific prestige and a covert assertion of the primacy of theology over science" (Polkinghorne, 2012: 68). For Polkinghorne, critical realism allows scientist-theologians, such as himself, Barbour, and Peacocke, to find a consonance between science and theology. He points out that

> the scientist-theologians seek a consonant relationship between the insights of science and of systematic theology of a kind that fully respects the integrity and authority of both disciplines in their proper domains. There is nothing 'preposterous', 'inauthentic', 'lacking in intellectual honesty' or 'patronizing' in this work (Polkinghorne, 2012: 68-69).

There are, Polkinghorne maintains, simply significant analogies between science and theology that allow him and other critical realists to define their relationship in terms of consonance. Instead of suggesting a point of view that lacks intellectual honesty or simply hijacks scientific realism, Polkinghorne maintains that critical realists suggest several sustained arguments to support their quest for finding consonance between science and theology, and critical realism is very significant as a methodology to unravel such a relationship between science and theology.

But how should we evaluate this evident disagreement between Gironi and Polkinghorne? Is critical realism, as Gironi says, hijacking realism in science for the sole purpose of allocating a certain primacy of theology over and against other academic disciplines? Whilst his wording seems to be strong and polemical, Gironi does seem to have a point in considering critical realism as being far from neutral in discussing their relationship between science and theology. There is, for example, a

strong tendency amongst some critical realists to consider theology "as the great integrating discipline that expresses the unity of our knowledge of the one world of our experience" (Polkinghorne, 1996a: 12). Rather than a – what might be called – 'flat' view of academia, which gravitates around the equality or independence of each discipline, some critical realists seem to introduce a hierarchical order, such as Polkinghorne does in the previous quotation. Theology here is not one discipline amongst other academic disciplines. On the contrary, Polkinghorne could be read as suggesting that theology should shift to the centre of academia and becomes the 'great integrating discipline'. A similar sentiment can be found in Peacocke, who talks about theology as the 'constitutional monarch' over the sciences.[2] Construed in such a way, the adage of medieval philosophy as *ancilla theologiae* seems to be revived and applied to all the sciences.

Furthermore, whilst it might be an exaggeration to claim that critical realists really want to revive the medieval idea of science as *ancilla theologiae*, there is – at least to me – a sense of unease with Polkinghorne's strong rejection of the arguments put forward by Gironi. There indeed seems to be an apologetic narrative that underpins the endeavours of critical realism in the science-theology exchange; an aim that is aptly summarised by Barbour as follows:

> For many people today the challenge of religious belief arises not from any conflict of content between science and religion but from the assumption that the scientific method is the only road to knowledge. Thus the concern for methodological issues, found among both scientists and theologians, has far-reaching implications for the outlook of modern man (Barbour, 1966b: 137).

Critical realism, then, suggests an alternative narrative, where this reductionist view of 'science as the only road to knowledge' is replaced with a more nuanced account that recognises several roads to acquire knowledge, including theological knowledge. But how do critical realists suggest such an alternative story?

For this, we could turn again to Barbour, who claims that "science is a more human enterprise, and theology is a more self-critical undertaking, than is indicated in most of the recent discussions" (Barbour, 1966b: 4). Science should not be understood as

[2] See e.g. Peacocke, 1984: 37. Similar sentiments can be found in the aforementioned reference to Polkinghorne, where theology is defined as the "great integrating discipline" (Polkinghorne, 1996a: 12).

this objective and mechanic-like approach that leads to infallible knowledge claims. On the contrary, in Chapters 5 and 6 on 'The Humanisation of Science', we have explored several arguments suggested by critical realists to demonstrate the subjective elements that underpin science. On the other hand, theology is much more science-like than it is often assumed; a theme that we discussed in Chapter 7 'The Scientisation of Theology'. A similar sentiment is echoed in Peacocke's summary of his argument in *Intimations of Reality*:

> I hope I have been able to demonstrate that any judgment of science and religion as two far apart, flanking, and limiting routes of human exploration into reality is at the best superficial and at worst disastrously misleading. No more can we see science as, on the one hand, all objective, rationalistic, and realistic and religion, on the other, as subjective, emotional, and possibly hallucinatory. For the scientific and theological enterprise share alike the tools of groping humanity – our stock of words, ideas, and images that have been handed down, tools that we refashion in our own way for our own times in the light of experiment and experience to relate to the natural world and that are available, with God's guidance, to steer our own paths from birth to death (Peacocke, 1984: 50-51).

With Barbour and Peacocke's quotations in hand, we may well have found the apologetic strategy of critical realism: demonstrating the human elements that underpin science and arguing for a theology that looks very similar to science as a means to ward off epistemological reductionism, where science is understood as the only avenue to knowledge.

But, there is also a very significant challenge that we could pose against Gironi's case against critical realism. He seems to argue for the possibility of a more neutral position, claiming that "we should aim for a realism informed by and consistent with the most recent theories from the physical sciences, able to feed back into scientific practice an ontological outlook free from the constraints imposed by these out-dated, ideological conceptual schemes" (Gironi, 2012: 67). If neutrality is the main issue for Gironi, and, as far as I can see, his argument gravitates around this, the problem is if we could actually find any neutral position to facilitate engagement between science and theology at all. First and foremost, Gironi himself is not entering the dialogue with critical realists from a neutral perspective: he clearly endorses metaphysical

naturalism. As Gironi puts it, "the realist seeks a reality that cannot be reinscribed into an eternal knowledge and that indeed has the power to force a continuous rearrangement of knowledge" (Gironi, 2012: 73). However, it would be rather absurd to call metaphysical naturalism neutral. But, second, Gironi seems to be rather naïve here, assuming that there is indeed such an 'objective' or 'neutral' way to ground scientific realism. A very strong argument suggested by critical realists, and barely discussed by Gironi, has been their metaphysical stance, which we have explored in Chapter 2 'The Mind-Independence of What?'. According to critical realism, all knowledge claims are scheme-dependent: there is no theory-neutral or theory-free observation. Even if we could ground scientific realism on the most recent theories of physical science, then there are still countless metaphysical and epistemological presuppositions that we would bring to the table. Hence, Gironi seems to require from critical realism to be a neutral position, but it is impossible for any philosophical position to provide such a neutral account.

For sure, critical realism is a suggestive position, because there are indeed apologetic motives that underpin critical realism. Preferences amongst critical realists for certain philosophers, ideas, and their take on certain philosophical commitments may well be guided by their possible pre-determined search for consonance between science and theology. But the main question is if such a state of affairs is really such a negative thing as Gironi seems to suggest. If indeed all our knowledge claims are scheme-dependent, as critical realism maintains, and none of our claims are theory-neutral or theory-free, then every philosophy we will use in science-theology scholarship lacks such neutrality, and critical realism is then one of the many that has been suggested in defining the relationship between science and theology. As such, none of the philosophical schemes could offer the neutrality that Gironi seems to desire. Thus, critical realism may well have a clear preference for the Christian faith and the positioning of theology as an academic discipline, but there is no philosophical scheme that would offer a more neutral position.

8.1.2 Critical Realism as Presupposition

Critical realists do not simply want to restore theology within academia, but, secondly, they also want to suggest a new narrative for theology and its practices. Studying these new developments in philosophy of science has led them to realize the relevance of these developments for theology. As Wentzel van Huyssteen puts it, "I am convinced

that scientific realism, in the form of a qualified critical realism, has tremendous resources for supporting the reliability and validity of theological assertions" (van Huyssteen, 1989: 155). Theology should be understood as a discipline that is more akin to science, and theologians should learn to speak the language of (philosophy of) science when reflecting on their research and the methods applied. As such, and similar to the Cappadocian Fathers, critical realists aim to provide a kind of 'superstructure' for theology that is grounded on these current developments in (philosophy of) science.

What is this new narrative then, according to critical realism, for theology? We have spent a significant amount of effort in Chapter 7 'The Scientisation of Theology' elaborating this new narrative for theology according to critical realism. Let me provide a very brief summary of the narrative of critical realism concerning theology and its methodology. Due to the unprecedented success of the (natural) sciences, the status of theology as an academic discipline has been severely challenged. Because of this 'existential pressure' on theology, critical realists have set out to redefine theology in such a way as to meet their standards of what they would understand as science. Central for critical realism seems to be the idea that theological reflection should be grounded on evidential data, where the term 'data' is understood in two ways, namely as religious experiences and as religious narratives. Theological data are then clustered into hypothetical theories, which allow theologians to formulate tentative religious statements. As such, all theological reflection starts from below, and Polkinghorne introduces the term 'bottom-up' for this approach. Good theology –it seems – is determined by applying the terms and conditions akin to (philosophy of) science, and, as a result, theology is presented in such a way as to have significant similarities with the methods and approaches used in the natural sciences. In doing so, critical realism, thus, offers a rationale for theology to ward off theology's existential pressure.

But not only should our theological methodology be informed by (philosophy of) science. Theology should also engage with the results of science, allowing these results to inform our theological theorising. Examples here are plentiful: quantum mechanics could be used to understand divine action, or we could inform our story of creation with evolutionary theory and big bang cosmology. As such, critical realists seem to take Wolfhart Pannenberg's reason for engaging with science to heart:

> [Christian theologians] should take an interest in science because they have to account for the world of nature, including human beings, in the context of their

> existence as God's creation. When Christians confess God as the Creator of the world, it is inevitably the same world that is also the object of scientific descriptions, although the language might be quite different (Pannenberg, 2006: 359).

Therefore, rather than staying far away from science and scientific results, we should use science to inform our theological thinking and to reflect on our theological methodology, because critical realists seem to hope for a constructive contribution of the science-theology exchange to theology. As Peacocke puts it, "perhaps one day a new coherent theology might emerge prompted by this stimulus and so continue in our day what, for example, the Cappadocian Fathers and St Thomas Aquinas did in their times in relation to contemporary philosophy and science" (Peacocke, 1986: 128). Critical realists have found in (philosophy of) science such a stimulus for a new coherent theology.

In the previous two sections, we have explored the suggestive nature of critical realism by studying two functions that critical realism seems to play for Barbour, Peacocke, Polkinghorne, and others. First, critical realism is for some a constitutive element of an apology for Christian faith, where recent developments in (natural) science and philosophy have been used to warrant their belief in God. Whereas developments in philosophy of science have opened up a way for critical realists to suggest a possible apology for theology as an academic discipline and the Christian faith in general, they, secondly, simultaneously use (philosophy of) science to suggest a new narrative for theology. Theology should not become isolated from developments in (philosophy of) science; on the contrary, these developments should be used to inform our theological theorising. As such, critical realism suggests more than a philosophical framework for understanding the relationship between science and theology.

8.2 Critical about Critical Realism

Whilst the above discussion was concerned with shedding light on the suggestive nature of critical realism, we should now turn to the credibility of critical realism as a philosophical framework for relating science and theology by providing a more general and critical reflection. In the previous chapters, we have discussed certain specific weaknesses in the argumentation of critical realism. In Chapters 3 'Critical

Realism and Epistemology' and 4 'Models, Symbols, and Analogies', for example, we have looked particularly at various criticisms that Durrant poses against critical realism.[3] Chapter 7 'The Scientisation of Theology' was concerned with the critical realists' – at least in my view – problematic account of theology, which has been mainly characterised by the direct transferring of philosophy of science to theological practice.[4] As such, critical realism seems indeed to struggle for credibility in each of these specific areas. However, there are also more 'overarching' problems with critical realism, and it is to these problems that we will turn in the following paragraphs.

8.2.1 Critical Realism and its Status as a Well-Crafted Philosophy

First, critical realism has been generally perceived to be a well-articulated philosophical framework.[5] As Russell, for example, puts it, "Iain G. Barbour laid out a series of well-crafted arguments involving issues in epistemology (the kinds of knowledge we have), language (how it is expressed), and methodology (how it is obtained and justified)" (Russell, 2004: 45). But, a wider debate emerged that addresses the issue of the well-craftedness of critical realism. Is critical realism really a well-crafted philosophy? As Knight puts it,

> Does the lack of a fully convincing analysis of emergence in the scientist-theologians' work perhaps point to a general weakness in their work, arising from their being underequipped to grapple adequately with philosophical issues? Some have thought this to be the case and have asked in particular whether Polkinghorne – perhaps more than the other two scientist-theologians – sometimes deals with complex philosophical issues in too cavalier a manner, regarding them as issues that can be answered simply in terms of his experience as a physicist. However, others have argued that this impression is mistaken and arises only because Polkinghorne has in general been writing for a broad audience, for which too much emphasis on such issues would have been counterproductive. (Certainly he makes regular references to these issues in a way that makes clear that he is aware of them.) Some have, nevertheless, still posed awkward questions of this kind in the light of Polkinghorne's approach to

[3] See p. 89ff, 128ff.
[4] See p. 191ff.
[5] See Barbour, 1966b: 162-174; Russell, 2004: 45; Peters and Peterson, 2013: 186.

> another position broadly shared by all three scientist-theologians: their view of the 'critical realism' that is to be attributed to the languages of science and theology (Knight, 2012: 624).

Knight here seems to suggest two possible explanations: the lack of philosophical depth is either explained by a general weakness in the work of critical realists, i.e. their inability to comprehend and engage with the depth of philosophy; or it is explained by a purposeful act of critical realists in order to write for wider audiences. How should we evaluate this? Whilst I recognise the fact that most of the work of critical realism has indeed been written for a wider audience, I set out to provide arguments for Knight's first option in the following paragraphs.

In the previous chapters, I have pointed out a number of weaknesses in the critical realist's argument, and a recurring concern here is the general tendency amongst some critical realists to oversimplify complexities.[6] Some critical realists seem to take a rather slogan-like approach in their philosophical endeavours. In the case of metaphysics, for example, critical realists seem to believe that the mere statement 'reality exists mind-independently' is sufficient for their metaphysical stance, ignoring the many subtle arguments developed by metaphysicians. Such a statement about the mind-independence of reality is grounded on numerous ontological, epistemological, and semantic assumptions that should have been explored and carefully defined as well.[7] But critical realists do not engage with these more in-depth issues. This becomes apparent by the fact that – as far as I can see – none of the critical realists have thus far responded to either Durrant's criticisms or the epistemological challenge of La Montagne to their endorsement of fallibilism.

Furthermore, if critical realists do set out to address certain debates in philosophy, they – as far as I can see – rely on sources and views dominant in the 1950s to 1970s. In introducing critical realism in the science and theology field, Barbour, for example, made use of and engaged with the then dominant figures, such as Hanson, Nagel and Kuhn, and others have followed Barbour in this direction. However, even though

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[6] The exception here is of course Soskice's work, who cannot be accused of oversimplification. Here I understand a narrower account of critical realism, i.e. Barbour, Peacocke, and Polkinghorne.

[7] As discussed in Chapter 3 'Critical Realism and Epistemology', the critical realist's claim that 'all knowledge is mediated', for example, leads to the problem as to how to explain the belief that – despite its mediated nature – our knowledge is nonetheless understood as referring to an object that exists outside the human mind. However, none of the critical realists have addressed this issue. See p. 89ff.

debates in philosophy have moved into various other directions, recent literature on critical realism still engages with and is situated in the critical stances towards logical empiricism of the 1950s and 1960s.

Adding to the apparent lack of engagement amongst critical realists is the rather occasional nature of critical realism in the science and theology literature. Whilst numerous articles and books have been dedicated to, say, scientific realism and its tenets, the elaborations of critical realism are often restricted to a few sentences, a handful of articles, or a chapter or two.[8] In the rather few cases where critical realists intend to elaborate their argument or defend a certain position, their views are generally limited to a couple of paragraphs or, as mentioned above, they are situated in the debates of the 1950s to 1970s. Most of the references to critical realism are thus made in passing, where prior knowledge of its constituents and commitments is often assumed. A *magnum opus* on critical realism in the science-theology exchange is currently still lacking.

Why, then, do critical realists disengage with relevant philosophical literature, and why is their account rather occasional? As far as I can see, there are at least two reasons for the underdeveloped state of this scholarship. First, due to the fact that critical realism aims to provide a comprehensive account of the two vivid domains of science and theology and by providing a philosophical underpinning, it has led critical realists into the territory of major debates in philosophy, such as ontology, epistemology, semantics, philosophy of science and philosophy of religion. Each of these fields consists of a vast body of literature and require a high level of expertise to be able to fully understand and engage with its literature. However, critical realists do not seem to be interested in developing the required expertise and skills to engage with this wider body of literature. Such an engagement would probably not be helpful for the critical realists in offering a more apologetic riposte to the oft-assumed conflict thesis between science and theology. Critical realists are more interested in finding ways for an enriching engagement between science and theology, which makes it unnecessary for them to engage with the complexities of these colossal philosophical debates.

Second, if it is indeed the case that critical realists are merely interested in establishing a framework, or a science-sympathetic religious worldview, then such an in-depth engagement with the various discussions in philosophy might not be

[8] Allen's *Ernan McMullin and Critical Realism* is an exception. See Allen, 2006.

necessary. Rather than a well-crafted philosophical system, the formulation of a number of core tenets seems to be sufficient here – and this is exactly what critical realists do. Adding complexities to this, such as introducing recent developments in philosophy of science or philosophy of religion, leads to a more complicated narrative. Taking into account that most of the literature that addresses critical realism has been written for a more general public, as Knight has pointed out, a narrative grounded on in-depth philosophical analyses might go above the capabilities of its audience. The opposite is true of, for example, philosophers of science, where there is a wider community of experts dealing with the same issues. This context of shared expertise allows philosophers of science to take a more developed stance. Such a context, however, is lacking in the science-theology exchange. Participants in this field have a very diverse background and debates in science and theology cover a large number of (academic) disciplines. As a result, if critical realism wants to be relevant to the science-theology exchange, in-depth engagement seems to be unhelpful to the more fundamental aims of critical realists, i.e. critical realism should be understood in terms of being instrumental to their endeavour of establishing an epistemic bridge between science and theology.

8.2.2 Mischaracterising Science, Theology, and their Relationship

There is also, second, a more fundamental problem with the account of critical realism, because critical realists – I would like to argue – mischaracterise the relationship between science and theology. Whilst this critique is not so much concerned with critical realism as such, we should take into consideration the underlying views of science and theology of critical realism, which – as I will argue here – seems to be problematic. What is the problem here? Critical realists, as far as I can see, seem to understand the interaction between science and theology as being rather one-dimensional, in which the many subtleties concerning both phenomena and their relationship are often overlooked. But, the relationship between science and theology seems to be much more dynamic, subtle, and complex than the critical realists presuppose. Let me point out a few of these instances where critical realists are rather naïve about the relationship between science and theology.

First, critical realists describe science and theology in singular terms, whereas plural terms would be more appropriate. Science is understood in terms of the natural sciences, but theology is also represented rather naïvely. Critical realists seem to

ignore the fact that their philosophy of science is deeply grounded in the natural sciences, and that a, say, philosophy of psychology, might actually differ from their approach to science. The German theologian Andreas Losch makes a similar argument, suggesting that such a narrow focus on the scientific realism of the natural sciences offers a limited perspective.[9] As Losch puts it, the realism that critical realists want to defend "is *natural* scientific realism, so to say; not social-scientific realism, and certainly not theological realism" (Losch, 2010: 409).[10] Losch, then, sets out to widen the scope of critical realism, allowing for other scientific disciplines to enter the relationship between science and theology. In order to establish his more interdisciplinary approach, Losch suggests a 'constructive-critical realism', which is grounded on a distinction that Losch borrows from Wilhelm Dilthey. For Losch, "*rationalities of natural, social, human science and of course theology are different ones*" (Losch, 2006: 281).[11] We should make a distinction, Losch maintains, between 'impersonal science' and 'personal science'.[12] Whereas the former should recognise the personal involvement of the scientist in scientific research, and should be preceded by the adjective 'critical', the latter emphasises the constructive capabilities of the those involved in the personal sciences, according to which the constructor structures social realities that are under observation. Losch's double adjective that precedes 'realism' then "recalls that each object has to be known in its own way", where "the 'critical' view of the personal element as a self-critical enterprise with universal intent may dominate in the process of the natural sciences; the 'constructive' view of the personal element may major in the process of human science – not to mention other domains of culture, such as arts and religion" (Losch, 2006: 283). As a result, differences on an epistemological level are recognised, allowing for the science-theology exchange to develop itself as a 'truly' interdisciplinary study.

We see a similar narrow focus amongst critical realists regarding their views of theology. Critical realists, for example, strongly engage with the more Western traditions of Christianity, i.e. Catholicism, Anglicanism, and Protestantism, but the

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[9] See Losch, 2010: 409.
[10] Italics: Losch.
[11] See Losch, 2006: 282. Italics: Losch.
[12] Unfortunately, Losch does not give any examples of disciplines that belong to the 'personal science'. Reading Dilthey, I assume that Losch refers to the disciplines that are traditionally part of the *Geisteswissenschaften* (humanities), over and against disciplines that are shaped on a natural scientific methodology.

Eastern traditions are simply overlooked. There is – as far as I can see – no engagement with, say, Greek Orthodoxy, which, according to Andrew Louth, puts a strong emphasis on "faith as expressed, and tested, in prayer and worship" (Louth, 2013: xix). Although Louth recognises that such an approach is not unique to Eastern Orthodoxy, critical realists, however, seem to be almost only concerned with the cognitive side of theology, which we will discuss below. But there is also another way in which critical realists seem to have a rather narrow theological focus. Not only are they concerned with Western traditions, critical realists also show a strong preference for Christianity, rather than other religions. Islamic theology, for example, is never discussed. Whilst such a focus on the Christian faith is understandable, i.e. all critical realists are Christians, critical realists could be read as suggesting that the Christian faith is more related to science than, say, Buddhism. Relating science to Buddhist theology might lead to a completely different account of the relationship between science and Buddhist theology. As Cantor and Kenny aptly summarise,

> Christianity is perhaps atypical in that it places so much emphasis on both theology and belief. Many other religions, including Buddhism and Judaism, do not share these characteristics. Moreover, even some branches of Christianity, such as Quakerism, which was forged as a reaction to mainstream Anglicanism, reject systematic theology and place far greater emphasis on religious practice than on belief (Cantor and Kenny, 2001: 778-779).[13]

As such and adding to the, what could be described as, one-dimensional understanding of science and theology, critical realists seem to restrict the relationship between science and theology to the level of ideas and arguments, and, thus seem to ignore parts of both practices that might be less relevant, such as certain practices and rituals used in religion to underpin their theology. For example, critical realists overlook the idea of 'lived religion', which puts an emphasis on the praxis of the religious believer rather than the institutionalised religious traditions.[14] Instead of abstract and theoretical doctrinal beliefs, lived religion is about practices and actions, such as taking care and community building, that people do in religious respect.

[13] For a critique of the current state of affairs of the science and theology debate from an Islamic perspective, see Nasr, 2006: 71-86.
[14] For the notion of lived religion, see Ganzevoort and Roeland, 2014.

Relating science and theology on a level of practices might lead to a completely different account, as liturgical rituals such as prayer and communion are absent in the sciences, then a relationship in terms of theoretical ideas. Both science and theology are complex phenomena. At one level, science and theology could be characterised as a mere set of arguments, ideas, and presuppositions, whilst both are, simultaneously, also social, hermeneutical and historical phenomena. As a result, science and theology could be related on various levels, each with various levels of engagement, and the interaction between both phenomena could differ.[15] Due to their strong emphasis on theoretical knowledge, critical realism seems to be inattentive and insensitive to such a more complex view of science and theology.

Second, there is another aspect of the assumed one-dimensionality of the account of critical realism: the warfare-narrative still seems to prevail in the critical realists' account. Critical realists seem to embed their account in the conflict-harmony dichotomy, according to which science and theology could either be understood as being in conflict or in harmony. For critical realists, naïve realism defends the apparent conflict between science and theology, whilst critical realism aims to offer an alternative position that allows for an enriching engagement between both domains. However, as John Hedley Brooke has demonstrated in the context of history,[16] such a dichotomy is historically inaccurate, and, as far as I can see, it is also philosophically problematic as the relationship between science and theology is much more complex than critical realists seem to assume. According to Brooke,

> there is no such thing as *the* relationship between science and religion. It is what different individuals and communities have made of it in a plethora of different contexts (Brooke, 1991: 321)

As a result, what counts as science or religion in the seventeenth century could have shifted in later centuries. Due to this semantic flexibility, the historian, according to Brooke, needs to be attentive and sensitive to the shifting boundaries of both domains

[15] In Chapter 7 'The Scientisation of Theology', I already pointed out the different levels, or 'social locations', in which theology participates, ranging from academia, to the Church, to the wider society. See p. 200-202.

[16] It is important to note that Brooke does not address critical realism in his rejection of the conflict-harmony dichotomy.

as well as the historical contexts in which these terms have been used.[17] Due to their strong emphasis on similarities, and thus harmony, between science and theology, critical realists may lack the required attentiveness towards this semantic flexibility.

However, it is not only the historical relationship between science and theology that should be defined as 'complex', but it is also the, as it were, philosophical relationship between both domains that should be preceded by the adjective 'complex'. The conflict/harmony distinction that seems to underpin critical realism is still part of the 'old picture', but it is not the whole narrative. There are numerous factors at play at different levels, in addition to the cognitive aspect around which critical realism seems to gravitate. In putting forward his own views regarding the science-theology relationship, Stenmark aptly points out that "we need to go beyond the one-dimensional picture of science and religion that the monist view, the contact view, and the independence view give us, and apply the multidimensional framework composed of social, teleological, methodological, and theoretical dimensions in our attempt to characterize and identify interesting positions in the religion-science field" (Stenmark, 2004: 260). With each of these dimensions, we not only need to be flexible on the level of semantics, but also philosophical flexibility seems to be required. It may well be, for example, that certain social practices overlap between science and theology, whilst science and theology significantly differ on the teleological side. Furthermore, adding to the complexity is the already mentioned rather naïve comparison that critical realists seem to make by only comparing theology to the natural sciences. Science includes many other disciplines, such as law, medicine, chemistry, history, and so on, and the relationship between a particular academic discipline and theology may well differ significantly. Hence, the warfare-narrative is insufficient to actually define science and theology. What seems to be required is an approach that is more flexible on the level of philosophy and semantics.

As a result, the views on the relationship between science and theology that underpin critical realism seem to be inadequate to do justice to the complexities, dynamics, and subtleties involved, and, thus, the critical realists' oft-assumed ever-present and continuous interaction between science and theology, where both practices are deeply intertwined, and theology is relevant to almost all scientific research and vice versa, may well turn out to be a misrepresentation. Hence, in addition to chapter-

[17] See Brooke, 1991: 16; 321.

specific weaknesses, critical realism also seems to struggle for credibility in these more general areas.

8.3 Conclusion

In this chapter, we have made several critical comments about critical realism by using Hefner's diagnosis as a helpful framework. First and foremost, we have explored the suggestive nature by studying the aims and motivations underpinning critical realism. A helpful strategy for shedding light here has been Pelikan's distinction between 'apology' and 'presupposition'. Critical realism, as I have argued, aims to, on the one hand, re-establish the academic credentials of theology and, more generally, Christian faith, but, on the other hand, they also aim to provide a kind of 'superstructure' or a new narrative for a coherent theology. With our reflection on the suggestive nature of critical realism complete, we then turned to two apparent weaknesses in the narrative of critical realism, because – in addition to being a suggestive position – critical realism is also struggling for credibility. First, critical realism is sometimes understood as being a well-crafted position, and I have provided several arguments for rejecting such a view about critical realism. Second, critical realism seems to mischaracterise the relationship between science and theology on several grounds, such as putting too much emphasis on the cognitive side of theology. For critical realists, defining the relationship between science and theology should be done in terms of their propositional content and on the methods used to acquire and justify those propositions. But such an account seems to lead to a rather one-dimensional narrative. Identifying science only with its theories of natural phenomena, and theology with its dogmas and doctrines would be – at the least – a misrepresentation of both domains. For these reasons, I agree with Hefner's diagnosis that we should understand critical realism in terms of both being suggestive and struggling for credibility.

We have concluded our quest for understanding critical realism, and we are now in the position to make some concluding remarks about this research.

CONCLUSIONS

In the previous chapters, we have identified and explored the various key stances of our taxonomy of critical realism. In Chapter 1, I have introduced the notion of 'family resemblance' as a helpful metaphor for understanding the relationships between the various critical realisms suggested in science-theology scholarship, and we have unpacked the commitments of critical realism in subsequent chapters. In Chapters 2 to 4, I have defined critical realism along the lines of a conjunction of three stances that are shared amongst critical realists. First, critical realists endorse the metaphysical claim that reality and its furniture exist scheme-independently. Our knowledge claims, however, about this scheme-independent reality are always mediated, and the mediating conceptual frameworks are grounded in psychological and sociological contexts. As such, all knowledge claims are considered to be scheme-dependent. Due to this state of affairs, second, all knowledge is fallible and prone to error. Absolute and certain knowledge cannot be attained; a position that also deeply informs the semantic stance of critical realism. Thirdly, therefore, language refers to objects, but it does so inadequately, and all linguistic concepts are unable to exhaustively represent the object to which they refer.

Central here for critical realism are phrases such as 'incomplete', 'inadequate', 'prone to error', and 'theory-laden', because these phrases allow critical realists to suggest an alternative story to the optimistic narrative of the position critical realists tend to construe as naïve realism about the epistemological capabilities of science. These naïve realists aim to set a wedge between science and theology by pointing to the numerous successes of the natural sciences, and, from these success stories, they conclude that science could ultimately answer all life's fundamental questions. However, critical realists reject such an account, because it marginalises – or completely rejects – theology both in academia and public domains. With these phrases in hand, critical realists set out to show that science is indeed highly successful in understanding the natural world, but we nevertheless cannot ignore the sociological, psychological, and historical factors that are significant for the sciences (Chapters 5 and 6). Furthermore, we should not marginalise theology in any way, because theology

– as interpreted by critical realists – meets the academic standards and also uses the rigorous methods that we find in the (natural) sciences (Chapter 7).

However, as discussed in the various chapters, but particularly in Chapter 8, there are various shortcomings to the account of critical realism that warrants Hefner's view of critical realism as a position struggling for credibility. For example, we have explored in Chapter 3 that there is the epistemological concern about how to explain that our fallible knowledge claims are nevertheless reliable; a concern not really addressed by critical realists. A similar critique has been raised in Chapter 4 regarding their semantics: how to explain the tension that our semantic concepts are fallible but nonetheless referring? Critical realists do not really address such issues. A very strong critique against critical realism has been raised against their theological views. Critical realists set out to scientise – as it were – theology, but such an approach has severe weaknesses and shortcomings, which we have explored in Chapter 7. In Chapter 8, we have raised more general comments against critical realism. First and foremost, we have shown that critical realism is a suggestive position, because there are clear motivations underpinning critical realism. Whilst such motives are not a problem as such, I would urge critical realists to be more explicit about their motivations. But there are also shortcomings in the way critical realists characterise the relationship between science and theology, and we have addressed two of these shortcomings: critical realism as a well-crafted philosophy and the mischaracterisation of the relationship between science and theology. With these criticisms in mind, Hefner's analysis of critical realism as having to struggle for credibility seems to be valid.

Whatever the substantive results of this work, there are – as far as I can see – at least two more general outcomes that may be of use to the science and theology field. The first outcome of this study might be to foster the awareness amongst those who participate in the science-theology exchange about the philosophical complexities that are sometimes neglected or simply overlooked. There are numerous philosophical assumptions and presuppositions, held implicitly and explicitly, underpinning the dialogue between science and theology. Awareness of this philosophical heritage can help to move the science and theology debate forward. If the discussions of this work are heeded, then – hopefully – consciousness will be raised about the numerous philosophical debates that underpin our exchange, such as epistemological concerns and metaphysical considerations, but also the relevancy of deeply engaging with

relevant debates in the area of philosophy, such as epistemology, semantics, metaphysics, philosophy of science and philosophy of religion.

Another possible use of this work is to plea for a more sustained reflection on theology and theological matters within the field of science and theology, and, in addition, to recognise the pivotal role the science-theology exchange could have for mainstream theology. Currently, much of the science and theology literature seems to be deemed irrelevant or considered dubious in mainstream theological reflections. Most departments of theology have a chair in, say, systematic theology and biblical studies, whilst a chair in science and theology is often lacking.[1] Such a state of affairs makes sense, due to the apparent subordination of theology to the (natural) sciences in science-theology scholarship. Most reflections within the field of science and theology are one-directional, where science seems to dictate – as it were – the terms and conditions of the debate and theology must fit, match, and adjust to the emerging gaps. As far as I can see, we could attribute such a view to the rather dominant position critical realism seems to take within science-theology scholarship. As discussed in Chapter 7 'The Scientisation of Theology', critical realists aim to give theology a rather scientific outlook; an outlook, as far as I am concerned, that is unnatural for theological practice. Rather than participating according to the terms and conditions of the (natural) sciences, a theology that is sensitive to the sciences, whilst maintaining a firm ground in its own distinctiveness, might actually be more helpful in advancing our common quest of understanding reality for various reasons. First and foremost, God(s), or at least religion, is still a significant and dominant factor for many people around the globe, even in the 'secularised West'. Second, it is to theological practice that the reflections regarding the divine have been allocated. Third, due to its long history, theology has developed a plethora of methods to understand and engage with reality, such as hermeneutical and historical approaches, that might turn out to be valuable in complementing the methodological arsenal of science. Hence, theology does not have to retreat to the isolated place it often finds itself or to subordinate itself to the terms and conditions of the sciences; on the contrary, in order to nurture an enriching engagement between science and theology, a theology that stands firm in its own traditions and approaches, whilst being able to find ways of engaging with the

[1] There are of course a few exceptions here, such as McGrath's appointment as the Andreas Idreos Professor of Science and Religion at Oxford and Gijsbert van den Brink's chair in science and theology at the VU University in Amsterdam.

sciences if theology is not to shut its doors to these other forms of truth-seeking, will be essential to our dialogue.

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